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# GRASSES

## OF THE OTTAWA DISTRICT

**WILLIAM G. DORE**

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GRASSES  
of the  
OTTAWA DISTRICT

William G. Dore

Research Branch  
Canada Department of Agriculture

Ottawa, Ontario

Price \$1.00

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## INTRODUCTION

The family Gramineae, because of the great economic importance of some of its members, has probably received more attention from botanical and agricultural workers than any other plant family. Because of the vast number of species and the relative complexity of their diagnostic features, however, their identification usually requires the attention of a specialist.

The grass flora of the Ottawa area is now relatively well known, almost certainly because of the long line of botanists, agronomists and naturalists who have had an opportunity to study it. Among these students none has reached the pre-eminence of M. Oscar Malte who, first as Dominion Agrostologist and later as Chief Botanist of the National Herbarium, devoted much of his time to the classification of Canadian grasses. At the time of his unexpected death in 1933,\* he had just completed the manuscript of the Gramineae section of a projected flora of the Ottawa District started by his predecessors John and J.M. Macoun. The work was to be a standard systematic treatment complete with keys for identification, technical synonymy and detailed descriptions of genera and species. If it had appeared in print at that time, it would have provided an outstanding contribution to the knowledge of the grasses. The classification of grasses was then in a confused state and more in need of revision than at the present time.

Since 1953, we have seen the publication of two editions of A.S. Hitchcock's *Manual of the Grasses of the United States*, an eighth edition of *Gray's Manual of Botany* by M.L. Fernald, and a third edition of 'Britton and Brown' edited by H.A. Gleason and entitled *New Britton and Brown Illustrated Flora*. These three works covering a broad geographic area are quite adequate for use in the Ottawa District. They contain full descriptions as well as illustrations of all species represented locally.

In the preparation of the present treatment it was thought unnecessary to repeat such descriptive features. Instead, the attempt was to concentrate on the occurrence and local abundance of the various species and on their habits of growth. At the same time the aim was to provide an aid for identification by means of keys based on characters as conspicuous and distinctive as possible. The accomplishment of this latter aim has been made somewhat easier because of the few entities that are involved in an area of restricted dimension. It should be mentioned nevertheless, that, compared to other areas of equal size in Canada, the Ottawa District possesses a rather rich flora. This is due probably to the great variety of habitats found here as well as to the complexity of its physiographic history.

The 'Ottawa District' has been arbitrarily defined as the area around the city of Ottawa contained within a 30-mile radius. The precise locus of this radius has been taken as the Peace Tower of the Parliament Buildings. Besides being

\* For obituary see *Can. Field Nat.* 48: 89-93, 1934.





a symbolic structure, it is a feature indicated on the detailed topographic map and a landmark visible from many parts of the surrounding District. The District is divided almost equally between the province of Quebec on the north and the province of Ontario on the south by Ottawa River which flows from west to east through its center. The map (Figure 1) shows the chief political divisions (counties) of the District and marks the collecting localities mentioned in the text.

Most of the 2,250 specimens of grasses on which the identifications and reports are based are preserved in the herbaria of the Department of Agriculture (DAO) and the National Museum of Canada (CAN) in Ottawa, as of 1953. A few of the early District collections are at Queen's University (Q) and the University of Toronto (TRT). In addition to herbarium specimens, field records based on observations of the author have been used to fill out the distribution data. Specimens collected since 1953 have been admitted to the distribution maps, but only as "records" since they were obtained after the conception of distributional affinities had been established. It has not been feasible to cite individual specimens other than those of particular interest. Some acknowledgment of the contribution made by the various collectors who have gathered, prepared, and annotated specimens, however, is given in the appendix (Appendix I) listing the number of collections made each year from 1862 to 1953.

The sequence of tribes and genera follows that of Hitchcock's *Manual*, a sequence still acceptable to many North American authors on grasses. The species within a genus, however, are numbered in the order in which they happen to fall in the key and, as a result, their order is not necessarily that of their natural relationship. The generic descriptions apply only to the species found in the District. Synonymous names are mentioned when the accepted name differs from that used in the three manuals mentioned above.

The first *List of Plants Collected by Mr. B. Billings in the Vicinity of Ottawa, During the Summer of 1866* (Trans. Ott. Nat. Hist. Soc. 16-page separate) included 22 grass species. In James Fletcher's "Flora Ottawaensis" published in 1880 (Trans. Ott. Field Nat. Club 1: 59-60, 1880) 50 grasses were listed, and, in subsequent issues up to 1893 \*, 20 additions were made. Of these 70 species, the names of 20 are now obsolete. Further additions to the grass flora published in The Ottawa Naturalist up to 1913, accounted for 7 more species. Malte's manuscript treated 95 species of which 20 had names now outmoded. Dore and Groh in their "List of grasses of the Ottawa District" (Can. Field Nat. 52: 53-55, 1938) and its supplement (Can. Field Nat. 58: 193, 1944) gave 112 species, eleven of which now have obsolete names. The present treatment contains 124 species, with 30 additional varieties or forms. Of these species, 71 are native in the District; 53 are introduced and, in most instances, naturalized. From the check list in the appendix (Appendix II) the date of the first collection is noted and this date, in the case of alien species, indicates to some extent the time of their arrival. A few of the adventive species, such as *Bromus secalinus*, *Cynosurus cristatus*, *Lolium multiflorum* and *perenne*, *Avena fatua* and *Phalaris canariensis* are continually being brought in but seem unable to naturalize under

\* Boivin, B. and W.J. Cody. Bibliographic survey of James Fletcher's Flora Ottawaensis. Can. Field Nat. 69: 79-82, 1955.

our conditions. A large number of foreign species grown in introduction nurseries and check plots at the Experimental Farm are not treated as belonging to the flora of the District. The species commonly cultivated in fields, lawns and gardens, however, are mentioned.

## Family: GRAMINEAE

Briefly, the family includes monocotyledonous plants with noded, usually hollow, *culms*, 2-ranked leaves, and fibrous roots of temporary duration. The leaves are divided into *sheath* and *blade* at the *collar* where a *ligule* is situated on the inside. The *florets* consisting of two scales, a *lemma* and a *palet*, and their included sexual organs are borne either singly or in numbers on the axis (*rachilla*) of the *spikelet* which has two subtending scales, the lower and upper, or first and second glumes. The spikelets are arranged variously on the axis (*rachis*) or branches of the *inflorescence* or head. The three anthers are versatile; the ovary bearing 2 plumose stigmas, develops into a fruit (a grain or *caryopsis*) with a single embryo situated basally on the side of a larger endosperm. Considerable variability in the structure, appendages and number of these parts is encountered and provides the basis for separation of the genera and species in the keys. Two *lodicules*, diagnostic for the family, are not important in the subordinate classification.



## KEY TO GENERA

1. Spikelets bisexual, if some spikelets unisexual or neuter these distributed uniformly throughout the inflorescence and regularly among the bisexual.
2. Spikelets 1- to several-floreted, usually flattened laterally (i.e. compressed so that the margins of glumes and lemmas appear on the faces of the spikelet, the midveins forming the creased edges of the spikelet); axis of the spikelet breaking up at maturity between the glumes and the lowest floret and generally between each floret, also often below the glumes; a floret does not terminate the spikelet-axis (rachilla) which is usually prolonged beyond the uppermost floret as a slender or rudimentary appendage.
3. Spikelets in open, contracted, or occasionally spike-like panicles (but not in true spikes) where the individual spikelets have at least a short stalk.
4. Spikelets with 2 or more florets which produce fruit.
  5. Glumes shorter than the body of the first lemma; lemmas, if awned, with the awn arising as a continuation of its tip or from between its two terminal teeth (TRIBE I. FESTUCEAE).
  6. Stems usually less than 1.5 metres tall, not cane-like; blades less than 2 cm. broad; rachilla hairless or short-hairy.
  7. Callus of lemma naked or provided with curled soft hairs; sheaths open or closed to near the top; ligule free at margins.
  8. Ligule membranous; lemmas 5- to many-veined (veins sometimes obscure).
    9. Lemma awned (awn sometimes short) just below bifid tip; spikelets over 12 mm. long; grain pubescent at summit, adherent to palet. .... **1. *Bromus***
    9. Lemma awnless or awn-tipped; spikelets less than 12mm. long; grain glabrous and free from palet.
    10. Spikelets in open or contracted panicles, uniformly disposed (i.e. not aggregated into clusters or pairs) and distinctly pediceled.
      11. Lemmas keeled on the back, awnless, usually with a tuft of curled hairs from the back of the callus and with soft hairs from the midrib. .... **5. *Poa***
      11. Lemmas rounded on the back, hairless or with short hairs uniformly distributed over back.
      12. Lemma acute, with veins converging towards the tip which is sometimes awned; ligule very short.

- Grasses of drained soil. .... 2. *Festuca*
12. Lemma obtuse or rounded at apex, the veins not converging, awnless; ligule thin, long, membranous. Aquatic or wet-land grasses.
13. Second glume 1-veined; lemmas 7-veined; sheaths closed to near the top (sometimes rupturing along membranous front); rhizomes present. .... 3. *Glyceria*
13. Second glume 3-veined; lemmas 5-veined; sheaths open to base; rhizomes absent. .... 4. *Torreyochloa*
10. Spikelets on very short pedicels, crowded in one-sided clusters or "spikes".
14. Spikelets crowded in clusters at ends of stiff naked panicle branches; sheaths flattened. .... 8. *Dactylis*
14. Spikelets in a slender spike-like panicle, in pairs with a short-stalked sterile spikelet with narrow pectinate lemmas and a sessile fertile spikelet at each node; sheaths terete. .... 9. *Cynosurus*
8. Ligule a row of short hairs; lemmas 3-veined, hairless, awnless.
15. Low annuals. .... 6. *Eragrostis*
15. Coarse perennial. .... 7. *Molinia*
7. Callus of lemma bearded with stiff straight hairs (otherwise lemma hairless); sheath closed to top and the membranous ligule encircling the culm; lemmas awned. .. 11. *Schizachne*
6. Stems tall (2 to 3 metres) with cane-like, usually red culms and broad (2 to 3 cm.) blades; rachilla covered with long silky hairs which at maturity exceed the glumes; ligule a row of short matted hairs. .... 10. *Phragmites*
5. Glumes as long as the body of the first lemma or longer, often enclosing all the florets; the awn of the lemma, if present, arising from the back of the lemma or below its two terminal teeth (TRIBE III. AVENEAE).
16. Ligule membranous; no tuft of hairs at collar of sheath.
17. Perennials; spikelets less than 12 mm. long.
18. Awns absent.
19. Spikelets falling away completely at maturity; first

- glume very narrow; second glume broad at top.  
..... 19. *Sphenopholis*
19. Florets falling from spikelet at maturity, leaving the  
glumes on the pedicels; glumes nearly equal in size  
and shape. .... 20. *Trisetum*
18. Awns present.
20. Foliage pubescent; panicle spike-like. ... 20. *Trisetum*
20. Foliage hairless; panicle diffuse. .... 21. *Deschampsia*
17. Annuals; spikelets over 12 mm. long. .... 22. *Avena*
16. Ligule a row of fine hairs; a tuft of long hairs at collar.  
..... 23. *Danthonia*
4. Spikelets with but 1 fruit-producing floret; sterile or staminate  
florets, if any, situated below the pistillate floret.
21. Glumes present (one may be greatly reduced or obsolete).
22. Spikelets with one floret, this perfect; glumes longer or shorter  
than the spikelet (TRIBE IV. AGROSTIDEAE).
23. Lemma as thin as or thinner than the glumes; spikelets  
terete or flattened.
24. Spikelets (exclusive of awns) less than 7 mm. long;  
glumes well-developed (if very short, then lemma awnless);  
anthers three, sometimes one; foliage hairless.
25. Ligule membranous.
26. Plants tufted, stoloniferous or rhizomatous (with  
deep slender rhizomes with scale leaves readily  
decaying) and rooted at nodes.
27. Panicle open, or if contracted, the branches much  
longer than the spikelets; spikelets terete; glumes  
distinguishable as upper and lower and free at  
base, scabrous or hairless.
28. Lemma with numerous delicate hairs arising  
at its base and equaling at least half its  
length. .... 24. *Calamagrostis*
28. Lemma hairless at base.
29. Glumes somewhat longer than lemma.
30. Rachilla not prolonged beyond the sessile  
floret; palea very thin, half as long as  
lemma, or obsolete; lemma awnless or



- with a twisted awn from back; anthers three; ripe grain falling with lemma, the glumes separating later ..... 25. *Agrostis*
30. Rachilla produced beyond floret as a slender naked bristle; floret on a short stipe; palet almost as long as lemma and of similar texture; lemma with short awn near bifid tip; anther solitary; ripe grain falling away in complete spikelet. .... 26. *Cinna*
29. Glumes much shorter than lemma. .... 29. *Muhlenbergia*
27. Panicle cylindrical, dense and spike-like, its branches shorter than the spikelets; spikelets laterally flattened; glumes identical and fused together at base, pubescent.
31. Lemma awnless; glumes with awn-tips; palet present. .... 28. *Phleum*
31. Lemma awned from back; glumes awnless; palet absent. .... 27. *Alopecurus*
26. Plants with short, twisted rhizomes with numerous small overlapping scale-leaves, shallowly placed in soil and easily pulling up with plant, not rooted at nodes. .... 29. *Muhlenbergia*
25. Ligule a fringe of fine hairs. .... 30. *Sporobolus*
24. Spikelets over 7 mm. long; glumes very short, almost obsolete; lemma long-awned from tip; anthers two; blades pilose at least beneath, broad. .... 31. *Brachyelytrum*
23. Lemma firmer in texture than glumes, hard and shiny, terete or flattened dorsi-ventrally; plants tufted.
32. Lemma awnless, hairless, somewhat flattened; palet of similar texture and not covered by lemma; panicle branches rebranching; blades broad, soft and flat. .... 32. *Milium*
32. Lemma awned from tip with deciduous awn, appressed pubescent, terete and enclosing the palet; panicle with simple or once-forked branches; blades coarse, involute or rolling in on drying. .... 33. *Oryzopsis*
22. Spikelets with the two florets below the fruit-producing floret reduced to scale-like lemmas or staminate; glumes (excluding

- awns) longer than the spikelet (TRIBE VI. PHALARIDEAE).
33. Lemmas of sterile florets equaling or exceeding the fertile lemma in length; inflorescence golden brown, appearing in May or June; foliage bitter-tasting when fresh, sweet-scented when dry.
34. Glumes equal in size and shape, broad; lower florets staminate with broad acute lemmas; panicle open; basal blades much longer than culm and appearing later in season, hairless. .... 35. *Hierochloë*
34. Second glume much longer than first, wrapped around florets; lower florets neuter with narrow lemmas 2-lobed at apex; panicle spike-like; basal and culm leaves similar, pubescent. .... 36. *Anthoxanthum*
33. Lemmas of sterile florets much shorter than the fertile lemma; inflorescence greenish, pale or purple-tinged, appearing in middle or late summer; foliage not flavored or scented. .... 37. *Phalaris*
21. Glumes absent; lemmas broad and much flattened (TRIBE VII. ORYZEAE). .... 38. *Leersia*
3. Spikelets borne in true spikes (i.e. sessile on the inflorescence-axis or its branches).
35. Spike solitary with the axis segments flattened or concave on alternative sides and with one, two or three spikelets at each node (TRIBE II. HORDEAE).
36. Spikelets single at each node of the spike-axis (sometimes in pairs at lower nodes).
37. Spikelets with edge of lemmas next to spike-axis; both glumes present.
38. Perennials; spikes slender with 4- to 12-floreted spikelets. .... 12. *Agropyron*
38. Annual (or winter-annual), cultivated cereal grasses; spikes dense and stout with 2- to 5-floreted spikelets.
39. Glumes broad, 3-veined; lemmas awnless or long-awned; spikelets generally 3- to 5-floreted. .... 13. *Triticum*
39. Glumes narrow, bristle-like, 1-veined; lemmas long-awned; spikelets generally 2-floreted. .... 14. *Secale*
37. Spikelets with backs of one row of lemmas next the spike-axis; lower glume absent (except in terminal spikelet). .... 18. *Lolium*



36. Spikelets more than one at each node of spike-axis.
40. Spikelets two at each node, both alike.
41. Glumes well developed; spike dense, with appressed or ascending spikelets. .... 15. *Elymus*
41. Glumes obsolete or present as slender bristles; spike loose, with spikelets spreading horizontally after flowering. .... 16. *Hystrix*
40. Spikelets three at a node, the two lateral ones often reduced and sterile. .... 17. *Hordeum*
35. Spikes several, arranged racemosely in the inflorescence; spikelets single and closely overlapping along one side of the axis of each spike (TRIBE V. CHLORIDEAE). .... 34. *Spartina*
2. Spikelets with two florets but the lower one sterile and usually reduced to a lemma of similar size and texture to the upper glume, the upper perfect and producing a grain, its lemma often of firmer texture than the glumes; spikelet usually flattened dorsally (i.e. the midvein of glumes and lemmas appear on the faces of the spikelet); axis of spikelet breaking up between the first and second floret and below the glumes (but not immediately above the glumes), very short and not prolonged beyond the second floret which therefore terminates it.
42. Spikelets all alike, fruit-producing; lower glume shorter than the upper; culm hollow in the internodes (TRIBE IX. PANICEAE).
43. Spikelets not surrounded by bristles; inflorescence a panicle, or of digitate racemes.
44. Ligule evident; spikelets awnless, often pubescent but not stiffly hispid.
45. Ligule thin-membranous; inflorescence of several racemes, digitate at the top of the culm; spikelets in pairs, appressed along one side of the raceme-axis. .... 40. *Digitaria*
45. Ligule a row of hairs, often fused together in a membranous base; inflorescence a panicle, generally diffuse; spikelets not regularly paired. .... 41. *Panicum*
44. Ligule absent; spikelets with coarsely awn-tipped glume or sterile lemma and with coarse trichomes. .... 42. *Echinochloa*
43. Spikelets arranged in dense spike-like panicles, one to several slender bristles arising just below each spikelet; ligule a row of short hairs. .... 43. *Setaria*
42. Spikelets in pairs of two types at each joint of the hairy inflorescence-branch, one sessile and perfect, the other on a slender pedicel and

sterile, reduced in size or absent (only the pedicel present); lower glume longer than the upper; culm solid (TRIBE X. ANDROPOGONEAE).

46. Racemes with 6 to 10 fertile spikelets, solitary or few and digitate at the ends of the culm; rudimentary floret present, neuter. .... 44. *Andropogon*

46. Racemes with 2 to 5 fertile spikelets, numerous in an elongated panicle.

47. Pedicellate floret staminate. Large cultivated annual grasses. .... 45. *Sorghum*

47. Pedicellate floret entirely lacking from top of pedicel. Slender native perennial. .... 46. *Sorghastrum*

1. Spikelets unisexual, segregated into different parts of the plant.

48. Pistillate spikelets borne on upper branches of the terminal panicle, staminate spikelets on lower branches of the same panicle; aquatic annuals with thin partitions in an otherwise hollow culm (TRIBE VIII. ZIZANIEAE). .... 39. *Zizania*

48. Pistillate spikelets densely aggregated into "ears" on short lateral branches of the culm, staminate spikelets in terminal panicle; cultivated annual with pith-filled culm (TRIBE XI. TRIPSACEAE). .... 47. *Zea*

## TRIBE I. FESTUCEAE

### 1. *Bromus* L.

Annual or perennial grasses with large spreading panicles and several-floreted spikelets. Lemmas awned from below a bidentate tip. Grain pubescent at the tip and adherent to the palea. Blades broad and flat; sheaths closed to near the top; ligule membranous.

A. Perennials, vegetative shoots present; ligule less than 1 mm. long, firm and brownish, dried at edge.

B. Rhizomes present; lemmas with awns less than 2 mm. long, glabrous or sparsely puberulent near base; introduced. .... 1. *B. inermis*

B. Rhizomes absent; lemmas long-awned, pubescent; natives.

C. Lemmas with a dense fringe of hairs along the margins, the back being hairless. .... 2. *B. ciliatus*

C. Lemmas uniformly pubescent.

D. Lemmas and glumes distinctly hairy; blades 3 or 4; sheaths not flanged at top; ligule not hairy; panicle nodding. .... 3. *B. kalmii*

D. Lemmas minutely hairy; glumes scabrous only on the veins; blades 6 to 10 per culm; sheaths overlapping the nodes, flanged and with auricles at the top; ligule hairy on back; panicle branches wide-spreading. .... 4. *B. purgans*

A. Annuals, all shoots producing panicles; ligule 1 to 3 mm. long, thin-membranous and dentate at edge.

E. Lemma firm and broad, hairless, its teeth blunt, firm and less than 1 mm. long, its callus blunt.

F. Foliage hairless; awn shorter than lemma (sometimes almost lacking) and kinked. .... 5. *B. secalinus*

F. Foliage pubescent; awn longer than lemma, straight or curved on drying. .... 6. *B. japonicus*

E. Lemma slender, with transparent membranous margins, its teeth slender, membranous and 2 to 3 mm. long, its callus sharp-pointed; foliage pubescent ..... 7. *B. tectorum*

#### 1. *Bromus inermis* Leyss. AWNLESS BROME-GRASS; SMOOTH BROME-GRASS

An important economic grass introduced from southern Europe, 'Brome' is being used to an increasing extent for hay and pasturage in the District. Because of its strong sod-forming characteristics it is most effective in holding road banks against erosion; sown for this purpose, it has become conspicuous within the



last few years along road shoulders, particularly in those stretches out from Ottawa, Hull and Aylmer where almost continuous stands have formed. Great variation can be seen in the size, color and attitude of the inflorescence. Such features show up most strikingly in the clonal patches when in bloom about the end of June. First collected in "open woods, Glebe" by *Harrington* in 1906. Map 1.

Late in the season proliferous spikelets are sometimes produced in second-growth panicles (f. *proliferus* Louis-Marie), but such physiological growth-phases are usually not given technical names.

## 2. *Bromus ciliatus* L. FRINGED BROME-GRASS

The most common of our native brome-grasses, frequent in moist open woodlands and along rocky roadsides.

Considerable variation is shown in the degree of pubescence of the foliage. Certain plants can be placed in the hairless or nearly hairless typical variety, var. *ciliatus* (var. *genuinus* Fern.; var. *denudatus* (Wieg.) Fern.), and others in the densely pubescent variety, var. *intonsus* Fern. Both are about equally common (9 vs 14 specimens) and show no difference in habitat or distribution within the District. Late-developing plants with sparser panicles, maturing with red-tinged spikelets and expanded palets, have been described as *B. dudleyi* Fern. (*Rhodora* 32: 63, 1930). A specimen (Wakefield Lake, *Senn* 399) has been so reported (*Dore & Groh*, 1944), but this entity should not now be retained. Map 2.

## 3. *Bromus kalmii* Gray KALM'S BROME-GRASS

A rare native species, attractive in its drooping panicles of hairy spikelets which turn purplish brown after flowering, and in its erect, relatively broad and mainly basal, pilose blades.

Known to occur in the sand at Constance Bay, and on shallow limestone plains near Harwood Plains and at the Burnt Lands east of Almonte where it grows in considerable abundance. The earlier collections at Hull (*Fletcher* in 1880), Rockcliffe (*Macoun* in 1911) and Lemieux Island (*Malte* in 1923) have never been repeated; at these stations, the plants are now probably extinct. It seems to have persisted in habitats that have never become solidly wooded over, such as terrain excessively dry in midsummer but completely saturated for long periods in spring or after prolonged rains. It enters the District on the fringe of its wider range to the west. It likely migrated over denuded rocky hills during a period when the climate was more favorable for its spread. Map 3.

## 4. *Bromus purgans* L. FLANGE-SHEATHED BROME-GRASS

A large native species distinctive in its numerous blades and strongly auricled sheaths which conceal the culm except immediately below the panicle. Very rare in the District; known only from the banks of Rideau River at Billings Bridge (*Malte* in 1922), of North Castor River near Edwards (*Dore & Moore* in 1949), and of Bear Brook near Bourget (*Dore* in 1953). It extends from southern Quebec through the lower Ottawa Valley up to these stations with further, and

apparently isolated, occurrences along Picanoc River and Kazabazua Creek about 50 miles north of Ottawa. Map 4.

Until recently (see Wagnon, in *Rhodora* 52: 209-215, 1950), this species was known as *B. latiglumis* (Shear) Hitchc., under which name it still appears in most manuals; the "*B. purgans*" of current manuals does not occur in the District. Our specimens are less pubescent on the glumes, lemmas, and sheaths than others within the range of the species.

This tall leafy species might repay investigation from the standpoint of its value as a hay grass. The spikelets are sometimes parasitized by a gall-producing mite; a similar condition is frequent in *B. ciliatus*.

#### 5. *Bromus secalinus* L. CHESS

A serious weed in grain fields in southwestern Ontario but not so in the Ottawa District. Specimens have been collected at Galetta (wheat fields, *Whyte* in 1879), Ottawa (in 1894), Wakefield (along railway track, *Macoun* in 1903), and Chaudiere (in C.P.R. yard, *Macoun* in 1903). As no plants have been found since 1903, it must be assumed that the early introductions have not survived, conditions in the District having proved unsuitable for persistence of this grass. Map 5.

Chess, also known as Cheat, occurs so consistently as a weed in wheat fields in Europe that an old belief contends that wheat grains remaining on the ground over winter evolve in some mysterious way into cheat the next year. This belief was early carried over to America and continued to be firmly held. In fact the Dominion Botanist, in 1909, found it necessary to put out demonstration plots of wheat and cheat side by side at the Experimental Farm to prove to farmers that the belief was false (Ann. Rpt. Exp. Farms for 1909-10: 283). Incidental to this demonstration, it was found that *B. secalinus* when planted in the fall gave a high yield of good quality hay early the next summer. There is no present evidence, however, that the grass was put to this purpose.

#### 6. *Bromus japonicus* Thunb. JAPANESE CHESS

A serious weed in the United States and becoming so in southwestern Ontario and in southern Alberta. In 1935 plants were collected in a seeded pasture plot on the Experimental Farm (*Dore* 1) and in 1952 an infestation in the Forage Introduction Nursery was noted (*Jenkins* 4090). In 1949 plants were found in a lawn constructed of new soil at Woodroffe (*Frankton* 848) but these were individually eradicated. Other establishments may already exist in District. Map 6.

#### 7. *Bromus tectorum* L. DOWNY CHESS

A recent arrival in the District and, in contrast to *B. secalinus*, threatens to spread and become a most bothersome weed. First collected in 1946 at Beechgrove (*Groh* 2729), then at Woodroffe in 1950 and 1951 (*Frankton* 1130, 1304) and at Wakefield in 1953 (*Dore* 14219), at each place occurring on cinders along railroads. In 1955 the Wakefield infestation was again investigated and incipient



stands were found, presumably having recently spread from that original locus in an essentially continuous band along the railroad tracks as far as Farrellton, with more scattered patches at Low, Venosta and Kazabazua stations. It had not then spread to adjacent land or roadsides. Map 7.

The weed appears to have encroached on the District from the southwest. It reached Smiths Falls in 1943 (*Groh 1947*) and occurred earlier at places farther removed in that general direction. Its panicle matures early and the spikelets break up readily; the sharp-pointed 'seeds' are capable of working their way into clothing or into the fur and the skin of animals causing annoyance and possible infection.

*Bromus arvensis* L. Collected at the Experimental Farm in 1923 (*Malte*), it has not persisted nor spread as at some other places in Ontario.

*Bromus pumpellianus* Scribn. A native species of western Canada and rather similar to the alien *B. inermis*, is shown in a published plot-map (Elliott, Evolution 3: 142-149, 1949) as occurring approximately at Ottawa. This record is considered to be erroneous; no specimens have been collected in eastern Ontario or Quebec.

2. *Festuca* L.

Perennials with or without creeping rhizomes. Inflorescence a panicle; spikelets 2- to many-floreted. Glumes unequal in length, sharp-pointed. Lemmas firm, rounded on the back and often tapering into an awn, their veins 5 in number or obscure. Foliage hairless; sheaths closed; ligule membranous, very short.

- A. Blades over 2 mm. broad, flat.
  - B. Spikelets 4- to 10-floreted, borne throughout the panicle; lemmas 5 to 7 mm. long with thin membranous tips; introduced species.
    - C. Panicle closely contracted and usually curved after flowering, plant not densely tufted; auricles not ciliate. .... 1. *F. elatior*
    - C. Panicle branches stiffer and spreading; plants forming dense tussocks; auricles ciliate. .... 2. *F. arundinacea*
  - B. Spikelets 3- to 5-floreted, borne near tips of the long spreading panicle branches; lemmas firm to tip, inconspicuously veined; a native species of woods. .... 3. *F. obtusa*
- A. Blades narrow, usually permanently folded and slender-cylindrical, less than 2 mm. in diameter.
  - D. Lemmas awned; blades 0.5 to 1.5 mm. in diameter.
    - E. Dead sheaths at base of plant red-brown or dark brown, splitting between the veins into fibers; rhizomes present. .... 4. *F. rubra*
    - E. Dead sheaths whitish or drab-colored, smooth and leathery, not breaking up into fibers; rhizomes absent, plants densely clumped..... 5. *F. ovina*

D. Lemmas awnless or with short awn-tips less than 0.5 mm. long; leaves very fine, 0.1 to 0.2 mm. in diameter. .... 6. *F. capillata*

### 1. *Festuca elatior* L. MEADOW FESCUE

A valuable hay and pasture species, commonly established through seeding but not widely escaped in District. The first specimen was collected by Macoun in 1898 along the railway, Mallock's Bay, Chaudiere. (*F. pratensis* Huds.; *F. elatior* var. *pratensis* (Huds.) Gray) Map 8.

### 2. *Festuca arundinacea* Schreb. TALL FESCUE

Three collections have been made: Deschenes (*Dore* in 1940), where the stand is extensive; Britannia (*Breitung* in 1948); Bells Corners (*Dore* in 1953), where there was a single clump on the highway shoulder. The plant is easily distinguished from *F. elatior* in the field by its coarser, taller growth and tussock-like habit; consequently, if it were now more widely established in the District, its presence would have been detected more frequently. Map 9.

It is often considered to be a variety of *F. elatior* ( $2n = 14$ ) but since it is hexaploid ( $2n = 42$ ) and has certain distinctive morphological characters, it should be kept separate as a species. Commercial strains known as 'Alta-fescue' and 'Kentucky-31' are now becoming available, especially for turf purposes. (*F. elatior* var. *arundinacea* (Schreb.) Wimm.)

### 3. *Festuca obtusa* Biehler NODDING FESCUE

A species characteristic of deciduous woods of Maple, Beech and Basswood, and, in the District, probably at the northern limit of its range. The tufted, dark green foliage and slender, leaning culms mark the species, especially in mid-June when the loose panicles are in flower; the grains ripen early and the spikelets soon shatter. Becoming scarce in the District, now restricted to undisturbed dry woods; our only native species of Fescue. (*F. nutans* Spreng.) Map 10.

### 4. *Festuca rubra* L. RED FESCUE

Certain 'creeping' strains of this species are excellent sod-formers and are now widely used for lawns where a dense uniform sward of narrow, bright green leaves is desired. Not native to the District, as yet escaped only sparingly to roadsides and waste places; first collected in 1926 (*Groh*); several indigenous variants are to be found in other parts of Canada. Map 11.

### 5. *Festuca ovina* L. var *duriuscula* (L.) Koch HARD FESCUE

Firmly established in sandy soil at several places in and near the City; originally introduced, probably as a lawn species, and widely planted. Because of its hard tufted growth, however, it is quite undesirable for turf and better species and strains of fescue now replace it. On the other hand, it will grow on sites where few other grasses will survive. Extensive stands are found on the deep sand deposit surrounding the 'Sandpits' at Uplands or on the face of the hill in



the Arboretum, exposed to severe climatic conditions in the winter and to almost continuous wear by the public. Elsewhere in the Arboretum, the stands (which, incidentally, show much variation in habit of growth and degree of greenness of the blades) stop abruptly where the sand leaves off and the heavier soil begins. Map 12.

A single collection of forma *hispidula* (Hack.) Holmb., with lemmas hairy, has been made at Constance Bay (*Breitung & Lloyd 3493*).

6. *Festuca capillata* Lam. HAIR FESCUE

In some respects this species is a desirable lawn grass since it tolerates the moist packed soil found in the shade of buildings in the city where other species fail. It is a delicate, fine-leaved grass (but difficult to mow), forming slowly expanding mats and is seldom seen in flower.

An extensive stand, possibly of a different strain than that found in old lawns, exists as a weed in a neglected field on the sandstone west of Bells Corners. This infestation is the only one of its kind in the District, similar to numerous ones in the Maritime Provinces. Judging from its extent and density it must have become established long before the first Ottawa District collections in 1944. The field takes on a conspicuous bronze coloration during the first week of June when the plants are in head and before other weeds exceed it in height. (*F. ovina* var. *capillata* Alefeld) Map 13.

*Vulpia octoflora* (Walt.) Rydb. var. *tenella* (Willd.) Fern. -- Located in 1949 along the railroad tracks at Lawn Station, above Shawville, Que., about 40 miles northwest of the City (*Frankton et al. 872*). A small, slender, weedy annual, probably spreading from the west, it is expected to enter our limits soon. (*Festuca octoflora* Walt., var. *tenella* (Willd.) Fern.)

3. *Glyceria* R. Br.

Perennial grasses of wet or aquatic habitats, producing rhizomes and bearing open or contracted panicles. Spikelets 2- to 12-floreted. Glumes membranous, shorter than the spikelet, 1-veined. Lemmas 7-veined, rounded on the back, awnless, smooth or scabrous but without hairs, the veins usually raised and distinct. Foliage smooth or scabrous, without hairs; sheaths closed to near the top; ligule thin-membranous; blades not ridged except for midrib. (*Panicularia* Heist.)

- A. Spikelets elongate, over 10 mm. long, lying appressed to the panicle branches on pedicels shorter than the spikelet. .... 1. *G. borealis*
- A. Spikelets ovate to oblong, less than 8 mm. long, on diffuse branches or on longer pedicels.
  - B. Panicle elongate, contracted, often nodding with ascending overlapping branches. .... 2. *G. melicaria*
  - B. Panicle loose with spreading or drooping branches.
    - C. Lemma smooth, with obscure veins. .... 3. *G. canadensis*

- D. Spikelets with 5 to 10 florets; lemmas 3 to 4 mm. long. ....  
 ..... var. *canadensis*
- D. Spikelets with 3 to 6 florets; lemmas 2 to 3 mm. long. ....  
 ..... var. *laxa*
- C. Lemmas ridged, with prominent veins.
- E. Panicle usually less than 20 cm. long; spikelets 3 to 4 mm. long;  
 lower glume 1 mm. long or shorter. .... 4. *G. striata*
- F. Plants 50 to 150 cm. tall; blades up to 7 mm. broad; panicle 10 to  
 20 cm. long; spikelets usually green; lemmas 1.5 to 1.8 mm. long.  
 ..... var. *striata*
- F. Plants 20 to 70 cm. tall, blades up to 4 mm. broad; panicle 5 to  
 15 cm. long; spikelets usually purple; lemmas 2.0 to 2.2 mm. long.  
 ..... var. *stricta*
- E. Panicle large and ample, 15 to 40 cm. long; leaves 7 to 17 mm. wide;  
 spikelets 5 to 8 mm. long; first glume over 1 mm. long.
- G. First glume 1.2 to 1.5 mm. long; spikelets purplish or green (rarely  
 yellow-green, as in f. *pallescens*); panicle branches slender;  
 sheaths smooth; native. .... 5. *G. grandis*
- G. First glume 2.0 to 3.0 mm. long; spikelets brownish-yellow;  
 panicle branches stiffer; sheaths scabrous; introduced. ....  
 ..... 6. *G. maxima*

### 1. *Glyceria borealis* (Nash) Batchelder NORTHERN MANNA-GRASS

Frequent in water along the shores of rivers, lakes and streams, often growing in large colonies. Early in the season the blades, greatly elongated, float out parallel to each other on the surface of the water. A native species, widespread across Canada. Map 14.

### 2. *Glyceria melicaria* (Michx.) F.T.Hubb. LONG MANNA-GRASS

Rare in the District; found in wet ground or along streams in the woods. For many years known only from the collections of Whyte at "Ox-bow, Nation River, 1889" and of Scott from Casselman in 1892, both just outside the eastern boundary of the District. In 1922, Malte found it at Mahon Lake near Wakefield and, subsequently, it has been collected at several other points on the Quebec side of the River (at Buckingham, at Kingsmere and elsewhere in Gatineau Park, near Luskville and north of Eardley). This species seems to have spread in a westward direction, across the northern part of the District, continuing into Ontario around Petawawa and the Mattawa River but not extending farther west in Canada. (*G. elongata* Trin.; *G. torreyana* (Spreng.) Hitchc.) Map 15.

### 3. *Glyceria canadensis* (Michx.) Trin. CANADA MANNA-GRASS; RATTLESNAKE GRASS

(a) Var. *canadensis*. Frequent on mucky lake margins, along edges of bogs



or in open swamps and ditches throughout the District. A native plant, widespread across Canada. Map 16.

(b) Var. *laxa* (Scribn.) Hitchc. Represented by only two collections, widely separated in the District: from a roadside swamp north of Eardley (*Dore & Anderson 5095*) and from an alder thicket bordering a ditch in Mer Bleue bog (*Jenkins 3161*). Plants of var. *canadensis* with immature panicles are frequently mistaken for it, yet some authors consider it a distinct species (*G. laxa* Scribn.) Its taxonomic status is still poorly understood and possibly it is of hybrid origin. The fact that it occurs sporadically across eastern Canada, generally as circumscribed clones, and often where the habitat has been disturbed, seems to indicate such an origin. The following species are generally found growing in association with it: *G. canadensis* var. *canadensis*, *G. grandis*, *G. striata* and *Torreyochloa fernaldii*. Map 16.

#### 4. *Glyceria striata* (Lam.) Hitchc. FOWL MANNA-GRASS

(a) Var. *striata*. Plants considered to be typical of the species are most common in open swamps, in flowing ditches and along stream banks. In the shade they tend to be weaker, more slender, with reflexed panicle branches and smaller, 2- or 3-floreted spikelets. Such ecads have created some difficulty in identification. The distichous arrangement of the blades on the vegetative shoots shows up well in these plants in wet pockets in woods where not obscured by other plants. For such plants the local term 'fan grass' is appropriate.

(b) Var. *stricta* (Scribn.) Fern. Almost as common as var. *striata* but confined more to wet fields and pastures or to shallow ditches and depressions where there is no free movement of water. In general, this is the more abundant variety in Canada, ranging farther to the north and completely across the country. Map 17.

#### 5. *Glyceria grandis* S.Wats. REED MANNA-GRASS

Common and abundant throughout the District, in ditches, open swamps and on muddy stream banks. A native species, widespread across Canada.

Forma *pallescens* Fern. A rare color-variant found sporadically within populations of the typical purple-panicled form. First detected in 1953 as a single small clone, conspicuous in its yellowish panicles amid a vast stretch of the typical plant filling a wet meadow northwest of Hazeldean; found again in 1954, but in larger and more dissected stands in wet fields along Mer Bleue. Map 18.

#### 6. *Glyceria maxima* (Hartm.) Holmb. GREAT MANNA-GRASS, ENGLISH WATER-GRASS

Following the detection of the stand at the Pakenham bridge by Gillett and Bowden in 1952, a survey conducted by Gutteridge (*Can. Field-Nat.* 63: 133-135, 1954) revealed numerous stands on Mississippi River above and below Pakenham, extending from a point just below Almonte down almost to Galetta. This large aquatic grass has been established for a longer time at points in Ontario farther to the south and west but is not known elsewhere in the New World; a native of



northern Europe. (*G. spectabilis* Mert. & Koch) Map 19.

4. *Torreyochloa* Church

Perennial aquatic grass producing weak reclining and rooting culms from a non-rhizomatous base. Spikelets 5- to 7-floreted in a few-branched panicle. Glumes membranous, shorter than the lemmas, the upper 3-veined. Lemmas rounded and uniformly scabrous on the back with 5 raised veins and obtuse membranous tips, awnless. Foliage hairless; blades scabrous and finely ridged above; sheaths open to base; ligule long, thin-membranous.

1. *Torreyochloa fernaldii* (Hitchc.) Church FERNALD'S MANNA-GRASS

Shores of ponds, springs or in ditches cut through bogs and swamps, the leaves and culms often extending into the water. An obscure grass, rather scarce in the District. Map 20.

Closely related to *T. pallida* (Torr.) Church, as pointed out by Fassett (Bul. Torrey Bot. Cl. 73: 463-464, 1946), and to be considered as a variety of that species with more northerly ranging distribution.

5. *Poa* L.

Perennial grasses (one a winter annual) of low to medium stature with panicles of small (generally 3 to 6 mm.) spikelets. Spikelets flattened laterally so that glumes and lemmas are keeled. Glumes and lemmas sharp-pointed but not awned. Lemma with 5 veins, the midvein and 2 marginal veins sometimes the only distinct ones; callus usually bearing a tuft of tangled web-like hairs; keel and marginal veins often appressed pilose. Foliage hairless, smooth or scabrous; blades often folded; sheaths closed at least part way up; ligule membranous.

A. Underground scaly runners (rhizomes) present, plants consequently forming spreading colonies.

B. Culms cylindrical, straight, with obscure nodes.

Also: panicle pyramidal, its branches generally in 5's and naked at base for over 1 cm; spikelets numerous; lemmas copiously webbed at callus and heavily pubescent on keel and marginal veins; rachilla hairless; blades deep green, parallel-sided, often folded tightly, numerous on basal sterile shoots; lower ligules 0.1 to 0.4 mm. long, firm, brownish, entire, ciliate, scabrous; naturalized; very common. .... 1. *P. pratensis*

B. Culms flattened, somewhat zig-zag, with prominent dark nodes.

Also: panicle slender to narrowly pyramidal, its branches short, 1 or 2 per node and naked for less than 0.5 cm. spikelets generally few; lemma with scant web and thin pubescence on keel and marginal veins; rachilla hairless; blades glaucous green or tinged with purple, tapering to the tip from a squarish base, flat or slightly folded, no leafy shoots at base of culm; lower ligules about 0.7 mm. long, firm-membranous, white, entire, ciliate, scabrous; naturalized; common. .... 2. *P. compressa*

A. Underground runners absent; plants in tufts or forming tufted scattered stands.

C. Plants perennial with firm stems, well-rooted.

D. Lemmas webbed at callus.

E. Lemmas with pubescent keel.

F. Lemmas pubescent on marginal veins.

G. Ligule short, less than 1.0 mm. long.

H. Rachilla pilose.

Also: plant dark green; panicle narrow-pyramidal, sometimes nodding, its branches divaricately rebranched and spreading in bloom; spikelets few, at end of branchlets, 2- to 4-floreted; glumes narrow with white margins, tapering gradually into awn-like tip; rachilla short-pilose; blades dark green, narrow (up to 2 mm. broad), flat, finely few-veined above, scabrous, square at base and spreading horizontally from stem; sheaths split to near base; ligule less than 0.5 mm. long, white, finely ciliolate; culms slender, cylindrical or slightly compressed, with dark exposed nodes, bearing leaves to near top; old naked culm-bases with enlarged nodes, prostrate and branching on surface or shallowly in soil; introduced; scarce; ..... 3. *P. nemoralis*

H. Rachilla hairless.

Also: plant strongly glaucous; panicle narrow pyramidal, erect, its branches wide-spreading and branchlets divaricate at flowering, contracted before and after flowering; spikelets rather few, 1- or 2-floreted usually glumes narrow with white margins, acuminate; rachilla hairless; blades 1.5 to 2.5 mm. broad, short, finely few-veined above, scabrous, ascending; sheaths split to near base; ligule 0.7 to 0.9 mm. long, whitish, transparent, ciliolate, sparse-scabrous on back; culms rather coarse and stiff, cylindrical, the nodes covered by the sheaths, upper half leafless; shallow soil on rock ledges; native; rare. .... 4. *P. (? glauca)*

G. Ligule long, over 1.5 mm. long.

Also: panicle broad-pyramidal in bloom, ample, its branches ascending; spikelets numerous; glumes broader and more abruptly acute; rachilla hairless; blades generally yellowish-green or tinged with purple, flat, firm, inconspicuously several-veined, closely ascending; sheaths split to near base; ligule whitish-transparent, thin, 1.5 to 3.0 mm. long, erose, scabrous; stems rather coarse, often reclining and rebranching late in season and sending up smaller secondary inflorescences; native; common. .... 5. *P. palustris*

F. Lemmas lacking hairs on marginal veins.

I. Lower ligules very short (less than 0.5 mm. long); sheaths



smooth.

Also: panicle large, its branches in 5's, long and ascending or spreading horizontally, not often drooping; spikelets few, toward end of branches; blades flat with numerous prominent, scabrous veins on upper surface; sheath closed to near top; lower ligules very short (often less than 0.1 mm. long), thin, transparent; culms leafy at base; native; scarce. .... 6. *P. alsodes*

I. Lower ligules long (1 to 4 mm.); sheaths slightly rough to the touch.

Also: panicle large, its branches 2 to numerous at each node, ascending or spreading at anthesis; spikelets numerous, well distributed on branches; glumes and lemmas white-margined; blades yellow-green and shiny on the back, the sheaths often pink or purple; ligules long (up to 8 mm.), thin, whitish; culms usually bent at base; introduced but not persisting. .... 7. *P. trivialis*

E. Lemmas lacking hairs on keel.

Also: panicle nodding with the branches in 2's, long and slender, with the few spikelets at their ends; lemma with scant callus web, otherwise hairless; blades with thin cartilaginous margins with fine close serrations, otherwise smooth; sheaths closed to top or nearly so, basal ones often purplish-red; ligule 1.0 to 1.5 mm. long, thin, white, toothed on margin, hairless on back; culms leafy at base; native; scarce. .... 8. *P. saltuensis*

D. Lemmas not webbed at callus.

Also: panicle large, open and nodding, its branches about 5 per node with the spikelets numerous toward their ends; blades broader than in any other species (about 1 cm. wide), firm, pale green; sheaths flattened, scabrous; ligule long (3 to 5 mm.), membranous, yellowish, hairless; plants forming dense tussocks; introduced; rare. .... 9. *P. chaixii*

C. Plants winter-annual, with soft weakly rooted base.

Also: panicle pyramidal, small but with numerous spikelets on the short branches; the branches mainly 1 or 2 per node, flowering and fruiting at all seasons; lemmas usually distinctly 5-veined, variable in pubescence from essentially hairless to appressed pilose on lower half of keel to densely pilose on lower part of keel, marginal veins and sometimes on intermediate veins, the callus essentially lacking a web; blades soft, bright yellow-green, flat or folded, generally with cross-wrinkles; ligule white, thin, entire, hairless, about 1 mm. long; naturalized; very common. .... 10. *P. annua*

# 1. *Poa pratensis* L. MEADOW POA; KENTUCKY BLUE-GRASS; SMOOTH-STALKED MEADOW-GRASS

The most common grass in the District; the chief component of lawns, old fields, pastures and roadsides or wherever the soil is not too wet or too shaded; a very valuable grass.

Early introduced and now found in most parts of the country; frequently



found in 'native-looking' habitats such as rocky outcrops in the woods, on sand dunes and shores. Map 21.

### 2. *Poa compressa* L. FLAT-STEMMED POA; CANADA BLUE-GRASS

A common species, present almost everywhere on well-drained soil, but particularly abundant and frequently the only grass on shallow soil over ledging limestone where the soil becomes alternately flooded in spring and highly desiccated in midsummer; also abundant on sand dunes and banks; an important and nutritious pasture grass.

Thirty collections have been made in the western half of the District and only one in the eastern, indicating that it may be scarce or absent on the flat deep soils in the latter sector. On the other hand, collectors may have gathered the plant more often when they found it in the rough, out-of-way places more prevalent in the western part and where its presence may have appeared unusual. Map 22.

### 3. *Poa nemoralis* L. WOOD POA; WOOD MEADOW-GRASS

Established for many years at a few sites in or near the City (Arboretum; Driveway at Bank Street; Rockcliffe; at White Bridge where extensive; King Estate; Blakeney) where it has resulted from early seedings of English lawn mixtures. At each site, the soil is sloping, well drained and sufficiently shaded to prevent growth of most other grasses. While tolerant of shade, it does not make a good turf because of its tufted, loosely rooted habit. Map 23.

### 4. *Poa* (? *glauca* Vahl)

This rare native species has not yet been identified satisfactorily but is related to the *Poa glauca* complex. The distinctive field characters are the strongly glaucous culms, sheaths and spikelets, tufted habit, and long exserted panicle. It grows on high rock ledges where it is usually associated with *Poa compressa* but from which it is distinguished by its lack of rhizomes, cylindrical, strict culms, and earlier flowering. It has been collected at two sites: on the granitic escarpment north of Breckenridge (*Dore & Cody* 47.123) and on a limestone ledge above Ottawa River, near Cumberland (*Dore* 16398). Map 24.

### 5. *Poa palustris* L. SWAMP POA; FOWL MEADOW-GRASS

Common throughout the District in wet places, in low meadows and pastures, in ditches, along shores, and in moist open woodland. Its panicle exhibits considerable variation in amplexness and number of florets per spikelet, depending on conditions for growth and the time of production. Map 25.

### 6. *Poa alsodes* Gray WOODLAND POA

A scarce woodland grass almost always confined to rich moist alluvium, along the flat banks of fern-lined streams; flowering in the first weeks of June and shattering its spikelets by the end of that month.

In general this species is present in Ontario mainly south and west of

Toronto, and in Quebec south of the St. Lawrence, but in Ottawa Valley it extends up to the City and then up the Gatineau to a point just beyond the limits of the District, at Kazabazua Creek. Map 26.

7. *Poa trivialis* L. ROUGH POA; ROUGH-STALKED MEADOW-GRASS

A common constituent of some lawn and pasture seed mixtures, the plants giving a soft, fine-leaved and bright green turf the first year, but does not persist long under the conditions of the District; in the milder portions of the Atlantic provinces and on moist soils in southern Ontario and Quebec it has become well naturalized. Map 28.

8. *Poa saltuensis* Fern. & Wieg. TWC-RAYED POA

Like *P. alsodes*, a scarce woodland species, but preferring dry rich deciduous woods, often over shallow bedrock, rather than alluvial woods. It flowers early in June and shatters its spikelets by the end of the month.

This species is fairly widespread across the southern part of Eastern Canada. In the Ottawa District it occurs on the edge of the Precambrian Escarpment but no farther to the north. The old stations at Stewart's Bush, Tetreauville, and Rockcliffe are now probably extinct. Map 27.

9. *Poa chaixii* Vill. CHAIX'S POA; BROAD-LEAVED MEADOW-GRASS

A single clump of this distinctive grass was found in 1951 under trees bordering the lawn on the King Estate, Kingsmere. This spot is the only one where this European species is known to have become established in Canada; it has been known at an area near Duluth, Minnesota, for a number of years. Map 28.

10. *Poa annua* L. ANNUAL POA; ANNUAL BLUE-GRASS; LOW SPEAR-GRASS

A common weed of gardens, roadsides and waste places; in lawns and pastures it fills in quickly where the perennial turf grasses have been thinned out by trampling, drought, or flooding. Readily recognized by its dwarf spreading habit, pale green color, and possession of panicles in flower or fruit at most seasons of the year from May to November, the plants dying in midsummer. Map 29.

6. *Eragrostis* Beauv.

Low-growing annuals with small open panicles of usually many and small spikelets. Spikelets many-floreted. Lemmas awnless, 3-veined, smooth or scabrous but not hairy. Foliage hairless or with a few long hairs, often with a tuft of long hairs at the collar of the sheath; ligule a row of short hairs.

- A. Plants rooting at the nodes, hairless; native, on muddy shores. .... 1. *E. hypnoides*
- A. Plants upright or spreading, but not rooting at the nodes; pilose hairs present at least at top of sheath; adventive weeds.
- B. Microscopic glandular depressions present on pedicels, panicle branches, keels of lemmas, sheaths and/or blade margins.



- C. Foliage (apart from the ligule region) hairless; well-developed spikelets 2.5 to 3.5 mm. broad, pale green to metallic gray in color. .... 2. *E. megastachya*
- C. Foliage sparsely pilose; spikelets 1.5 to 2.0 mm. broad, usually purplish. .... 3. *E. poaeoides*
- B. Glands absent (at least from inflorescence).
  - D. Spikelets (in well-developed panicles) 7- to 12-floreted, over 3.5 mm. long, more or less appressed to the panicle branches. .. 4. *E. pectinacea*
  - D. Spikelets (in well-developed panicles) 2- to 5-floreted, less than 3.0 mm. long, spreading. .... 5. *E. frankii*

1. *Eragrostis hypnoides* (Lam.) B.S.P. MOSS-LIKE LOVE-GRASS

A low-growing, delicate and rare, native species, extending northward from its main distribution to localized stations in the District on the floodshores of the Ottawa River and the lower parts of some of its tributaries. Specimens are available from: Ottawa River banks, Canada (*Scott* in 1891); Buckingham (*Scott* in 1891); Chaudiere Falls, Ottawa, marshes (*Macoun* in 1894); Hull, shores of the river below railway bridges (*Harrington* in 1905); Rapides-des-Chats, Que., sur la rivière Ottawa (*Rolland* in 1921); Brigham Creek, Hull (*Malte* in 1922). After a lapse of 25 years and revisits of these localities, the following collections were made: Leamy Lake, wet clay floodbank (*Dore & Calder* in 1947); Leamy Creek at confluence with Ottawa River, clayey floodshore (*Dore & Erskine* in 1952). The plant may be a relict from former estuarine conditions. Formerly confused with and reported as *E. reptans*, a distinct species of the southwestern States. Map 30.

2. *Eragrostis megastachya* (Koeler) Link STINKING LOVE-GRASS

Becoming common as a weed in southwestern Ontario in dumps, gardens and waste places. At Ottawa collections have been made at the Experimental Farm in 1900, 1909, 1911, 1934 and 1953 (where it has been repeatedly introduced rather than persisting) and at Hull in 1922. In 1953, Frankton discovered plants in his vegetable garden on Woodroffe Avenue, Ottawa, but otherwise it has not developed successfully as a weed. Map 31.

Reputed to give off a disagreeable odor from its numerous crater-like glands but this feature, if present at all, is scarcely discernible. (*E. major* Host; *E. cilianensis* (All.) Link)

3. *Eragrostis poaeoides* Beauv. POA-LIKE LOVE-GRASS

A weed of railroad tracks, cinder yards and refuse dumps, rapidly spreading throughout Canada. First detected in the District in 1936 on the railroad by Dow's Lake (*Dore* 334), but now abundant along most railroads, in dumps and in yards built up from cinders or ashes in the City. Specimens from railroads outside the City are from Wright's Grove, Waba Siding, Carleton Place, and Arnprior. (*E. minor* Host) Map 32.



#### 4. *Eragrostis pectinacea* (Michx.) Nees COMB-LIKE LOVE-GRASS

Similar to *E. poaeoides* in habit and habitat but not yet so prevalent. The first specimen in the City was collected on railroad tracks in 1933 (*Minshall*). Other specimens are from Hull in 1922 (*Malte*), Buckingham in 1923 (*Malte*) and 1930 (*Groh*), Thurso in 1935 (*Victorin & Rolland*), Buckingham Junction in 1938 (*Senn*), Hilson School yard, Ottawa West in 1949 (*Groh*), and sand beach of Ottawa River, Beechgrove in 1953 (*Groh*). Map 33.

#### 5. *Eragrostis frankii* C.A. Meyer FRANK'S LOVE-GRASS

The most recent *Eragrostis* to arrive in the District; found at Stittsville on the roadside shoulder in 1947 (*Dore & Gillett*) and at Westboro on a roadside in 1949 (*Groh*). Map 34.

*Eragrostis orcuttiana* Vasey, along with *E. pectinacea*, was a serious weed in the Forage Plants Introduction Nursery, Experimental Farm, in 1952.

#### 7. *Molinia* Schrank

Coarse perennial with long tapering blades, growing in strongly rooted clumps. Panicle large and elongated. Spikelets 2- to 3-floreted, smooth, purple-tinged, awnless. Base of blade and top of sheath hairy; ligule a row of short hairs.

##### 1. *Molinia caerulea* (L.) Moench MOOR-GRASS

A native of Europe, established as a single clump in dry open woods on the south bank of Rideau River about a mile above Billings Bridge (*Dore 13599* in 1951). This lone occurrence is likely the result of intentional introduction since other sporadic aliens (*Deschampsia caespitosa* var. *parviflora*, *Poa nemoralis*, *Luzula luzuloides* and *Plantago media*) occur at the same site where, for many years there was a secluded cottage garden. *Molinia* is known at only three other localities in Eastern Canada. Map 35.

#### 8. *Dactylis* L.

Stout, tufted perennial with broad, pale green blades closely flattened in the sheath and generally sharply folded at a prominent midvein. Inflorescence a panicle with spikelets aggregated into glomerules at the ends of the few, stiff, main branches. Spikelets much compressed, almost sessile, 3- to 8-floreted. Glumes and lemmas ciliate on the keel. Foliage hairless; ligule long, white, membranous.

##### 1. *Dactylis glomerata* L. ORCHARD-GRASS

A valuable hay and pasture species, successfully grown on fertile soils but subject to winter-killing. Frequent along roadsides and in waste places. Several minor morphological and agronomic strains are undoubtedly present in our local population. Map 36.

#### 9. *Cynosurus* L.

Slender perennial with spike-like panicles. Spikelets turned to one side on the panicle-axis, of two types mixed together, those spikelets with short pedicels

and composed of several sterile florets being larger and fan-like and obscuring the smaller sessile spikelets of 2 or 3 florets. Foliage hairless; blades narrow; inner sheaths often yellow at base; ligule membranous, short.

#### 1. *Cynosurus cristatus* L. CRESTED DOG'S-TAIL

A European species widely introduced but not prevalent in Canada except in the milder parts of British Columbia. Early reported as in "lawns at Ottawa (Fletcher, Fl. Ott.)" in Macoun's Catalogue of 1888, but represented by specimens only from sporadic collections between 1941 and 1948 from new lawn seedings; not persisting. Map 37.

### 10. *Phragmites* Trin.

Tall perennial with broad leaves and cane-like culms, growing from heavy rhizomes. Panicle large and plume-like, becoming silky after flowering late in summer. Spikelets several-floreted with long hairs from a rachilla which remains attached to the floret above it. Culms hard, hollow, generally purplish; blades broad, firm, hairless, often glaucous and generally fraying at the tip with age; ligule a row of short matted hairs.

#### 1. *Phragmites communis* Trin. COMMON REED-GRASS

Our tallest native grass reaching a height of 6 to 8 feet and forming dense thicket-like clones. Its patches, however, are highly localized at 10 or 12 places, mostly in the flat land south of the Ottawa River.

The probable site of the first collected stand, stated as "Mississippi River, Carleton Place" (*McMorine* in 1860) was located in 1953, less than a mile above the town. A second large stand occurs along the River about 15 miles below Carleton Place, opposite Antrim. The exact location of another old collection, "Ottawa, wet bogs" (*Scott* in 1891) is not known, and Macoun's stand, "Rideau River, above Minto Bridge" (1911) no longer exists. After a lapse of many years, several well-established stands have been discovered at other localities: Bowesville (*Dore* in 1940 and 1944), the stand now destroyed; Prospect (*Dore & Gillett* in 1947); Mud Pond (*Dore & Calder* in 1947, *Breitung* in 1948, *Dore* in 1949); Shirley Bay (*Dore & Breitung* in 1948); Winchester (*Frankton* in 1949); Bear Brook, Carlsbad Springs (*Dore & Moore* in 1949); Blackburn (*Dore & Hall* in 1952); Cobb Lake, Bourget (*Dore & Cody* in 1952); Luskville (*Groh & Dore* in 1953). All stands are only a few square yards in size, except the one in Shirley Bay which covers a few acres; that in wet rangeland near Winchester is said to be scattered over some 10 acres. It is thought that the species spread across the country soon after the retreat of the Champlain Sea, when the climate was warmer and the seasons longer; perhaps clumps of rhizomes were variously rafted along its receding shores. At any rate, the stands are now localized and maintain themselves vegetatively. There is no evidence of dispersal by seed although the seeds with their silky hairs, should well equip the plant for widespread wind dispersal. It is likely that the late-blooming panicles are killed by frost before the grains can mature. The name 'Common Reed-grass' is more appropriate in more temperate parts of the world where the plant is abundant wherever there is wet land. Map 38.



## 11. *Schizachne* Hackel

A medium-sized perennial with long arching culms and few-spikeleted, contracted panicles. Spikelets quite large (about 15 mm. long) on long pedicels, several-floreted but only the lower florets producing grains. Glumes shorter than the lemmas, generally pink or purplish. Lemmas rounded on the back, distinctly veined, long-awned from between the two terminal membranous teeth, with a ring of short hairs from the callus. Foliage hairless; ligule membranous, completely ensheathing the culm.

### 1. *Schizachne purpurascens* (Torr.) Swallen FALSE MELIC-GRASS

A rather common woodland species, growing especially on dry or rocky knolls. Probably uniformly distributed in the District originally, but now absent from agricultural areas because of clearing and grazing of the woods. Map 39.

## TRIBE II. HORDEAE

### *Agropyron* Gaertn.

Rhizomatous or tufted perennials with spikelets situated singly at the nodes of the inflorescence and, being sessile, forming a true spike. Spikelets 3- to several-floreted, placed with the margins of the florets against the rachis. Glumes equal, broad and rounded on the back. Lemmas awned or awnless, rounded on the back. Foliage generally hairless; sheaths frequently with auricles at the top; ligule short, firm and membranous.

A. Rhizomes present; spikelets breaking up at maturity and falling away completely from the rachis; anthers over 3 mm. long.

B. Blades broad, flat, lax, generally pilose and finely veined above, green but sometimes glaucous. A common weed. .... 1. *A. repens*

B. Blades inrolling readily, firm, scabrous and heavily veined above, glaucous. A rare adventive from Western Canada. .... 2. *A. smithii*

A. Plants tufted, lacking rhizomes: spikelets breaking up at maturity but the glumes persisting on the rachis.

C. Spikes slender cylindrical; anthers less than 2 mm. long. A native species. .... 3. *A. trachycaulum*

C. Spikes broad and flat due to the closely spaced and widespreading spikelets; anthers over 2 mm. long. A rare introduction from Asia. .... 4. *A. cristatiforme*

### 1. *Agropyron repens* (L.) Beauv. COUCH-GRASS

A very common and pernicious weed of meadows, cultivated fields, gardens and waste places. Generally very abundant along roadsides and on gradings; here its presence is quite desirable. The grass has strong soil-binding and sod-forming characteristics. In lawns and pastures it is usually present also, but since these are continually closely clipped or grazed, the plants are small and



repressed and contribute little to the herbage. The plant will thrive and develop vigorously if the sod is opened up.

Great variability is shown in stature and aspect of growth, in pubescence, glaucescence, awning of the lemmas, shape of the glumes, and in pubescence of the rachilla. Varietal and formal names have been given to plants possessing various combinations of these characters. Such characters are reproduced uniformly in all the stems of a clone and often become conspicuous when a plant comes to occupy large patches. Practically all the named varieties and forms occur within the District.

Our first specimen was collected in 1894 by Macoun in 'wastelaces at Governor's Bay, Ottawa'. It is suspected that the weed was introduced earlier than this, however, probably by the first settlers. Map 40.

## **2. *Agropyron smithii* Rydb. BLUE-STEM WHEAT-GRASS, WESTERN COUCH-GRASS**

A common native prairie grass, often growing in the slightly saline ground around sloughs in the West from where it has been unintentionally introduced to a few places in Eastern Canada. First collected in the District by Groh at Wrightville in 1923 and then by Frankton at Uplands in 1948, but at both sites it is now probably eliminated by construction works. Map 41.

## **3. *Agropyron trachycaulum* (Link) Malte WHEAT-GRASS**

A rather scarce native, confined to rocky outcrops and dry shallow soils where openings in the forest cover have always been present; collected at various places, but especially along the Precambrian Escarpment and on limestone pavements along Ottawa River and at the 'Burnt Lands' east of Almonte. Map 42.

Three varieties and numerous unnamed forms are present in the District. Malte was one of the first workers to give attention to the species complex in America and drew the distinction from the Old World *A. caninum*; then Fernald, and, currently, Senn and his associates have given much study to its detailed classification. Melderis has recently pointed out that the American plants are similar to *A. donianum*, known in Europe only from the highlands of Scotland.

## **4. *Agropyron cristatiforme* Sarkar FAIRWAY CRESTED WHEAT-GRASS**

A most successful grass developed for pastures and lawns in the drier sections of the Prairie Provinces, but in the Ottawa District (where it will grow equally as well in open habitats) as yet seldom encountered.

Apart from the experimental plots at the Farm and at the South March Ranges it has been found only on the sandy roadside fill along Dow's Lake (*Anderson* in 1942) and in an impoverished pasture with alfalfa near Beatty Point (*Lindsay et al.* in 1949). At Dow's Lake it likely became established from a seeding in 1941 and persisted well, expanding its stand to several hundred feet along both sides of the pavement, until 1954 when it was eliminated by the development of Colonel By Drive. Map 43.

According to P. Sarkar (Can. J. Bot. 34: 328-345 1956) this diploid plant

rates the status of a species distinct from the other members of the Crested Wheat-grass complex introduced from central Asia, *A. cristatum*, *A. pectiniforme* and *A. desertorum*, which are tetraploid.

*Agropyron trachycaulum* var. *glaucum* X *Hystrix patula* f. *bigeloviana*

A single sterile plant, intermediate between these species and consequently considered to be of intergeneric hybrid origin, was collected on the Escarpment north of Breckenridge in 1948 and described by Dore in the Canadian Field-Naturalist 64:39-40, 1950. Numerous plants of both supposed parents occurred at the site but further attempts to locate more of the hybrid at the site have been unsuccessful. A specimen from Mahon Lake near Wakefield collected by Malte in 1922 (CAN 118328) and claimed by him to have 100% abortive pollen may be another example of the same or similar hybrid. In this specimen the glumes are long (5 to 15 mm.) and well developed but the spikelets are in pairs on the thin rachis, their lemmas faintly veined similar to those of *Hystrix*. The spike is closed and *Agropyron*-like in appearance.

### 13. *Triticum* L.

Annual or winter-annual cereal grasses with robust spikes. Spikelets one at each node of the rachis, 2-to-5-floreted. Glumes broad with 3 irregularly placed veins, beaked or short-awned. Lemmas broad, firm and smooth, beaked or long-awned. Foliage hairless; auricles present at base of blade; ligule short, membranous.

#### 1. *Triticum aestivum* L. WHEAT

Wheat is cultivated in the District but often as a spring-sown crop. Stray plants spring up around barnyards, granaries and in dumps but the plant does not perpetuate itself from year to year by reseeding. The only specimen that has been collected outside of cultivation is from Bayswater Avenue dump, Ottawa, 1932 (Dore 92). (*T. vulgare* Host)

### 14. *Secale* L.

Annual cereal grass with spikelets forming a dense arching spike and arranged singly at the nodes. Glumes narrow and bristle-like. Lemmas broad, long-awned and ciliate on the keel. Foliage hairless; auricles sometimes present at base of blade; ligule short, membranous.

#### 1. *Secale cereale* L. RYE

Frequently cultivated, but not as extensively as barley, oats or wheat. Generally planted in the fall, the tall early-growing plants being harvested or plowed under the next summer. Stray plants sometimes volunteer in fields the year after harvest or appear in dumps and waste places from scattered grains.

### 15. *Elymus* L.

Tall perennials lacking rhizomes. Spikelets in pairs at each node of the erect or nodding spike, their glumes turned toward the front. Lemmas and glumes



long-pointed or awned. Sheaths with overlapping margins, sometimes with auricles at the top; ligule very short and coarse. Natives.

A. Glumes slender and awl-like, less than 0.5 mm. broad; lemmas with straight awns; glumes, lemmas, upperside of blades, and sheaths pubescent. .... 1. *E. villosus*

A. Glumes broadened (0.5 to 2.0 mm. broad) and flattened above the base.

B. Awns straight when dried; disarticulation of spikelet below the glumes; spike erect. .... 2. *E. virginicus*

B. Awns curved when dry; disarticulation above the glumes, the glumes persistent on the spike-axis; spike nodding.

C. Blades firm, hairless or scabrous, generally involute, generally less than 12 mm. broad and fewer than 10 per culm; spike arched-drooping. .... 3. *E. canadensis*

C. Blades thin, villous above, flat, over 13 mm. broad and generally more than 10 per culm; spike lax-drooping. .... 4. *E. wiegandii*

1. *Elymus villosus* Muhl.

Known only from the collection of W.B. Whyte in 1891 at "Chats Island" and identified as *E. glaucus* Buckley. The location presumably is the large island in the Ottawa River near Fitzroy Harbour, now known as Morris Island. The nearest Canadian occurrences are now in southwestern Ontario. This far-removed plant may have represented a remnant of a population that migrated in during the Xerothermic Period and became extinct in recent years. On the other hand, the label is not written by Whyte and the locality may be in error, yet the record is admitted (under *E. striatus* Willd.) to the Ottawa flora in Malte's manuscript.

2. *Elymus virginicus* L. VIRGINIA WILD-RYE

An abundant marsh, shore-line and flood-plain species, showing much variation in the District.

(a) The tall leafy form with inflated, yellow-green and smooth upper sheaths, and hairless foliage and spikelets is the most abundant variant and forms vigorous and dense stands along the rivers. Var. *virginicus* (var. *typicus*, Fernald in Rhodora 35: 198, 1933).

(b) The form with hirsute glumes and lemmas but hairless on the foliage is represented by specimens from the Gatineau at North Wakefield (*Macoun* in 1911), from the Rideau above Billings Bridge (*Minshall* in 1939), from Clarence Creek near Rockland (*Dore & Cody* in 1952), and from Bear Brook near Leonard (*Dore* in 1953). Var. *virginicus* f. *hirsutiglumis* (Scribn.) Fern.

(c) Plants with puberulent or retrorse-hirsute sheaths and pilose upper blade-surfaces appear to represent a variation characteristic of eastern Ontario and is quite widespread along the flood-shores of the Ottawa, lower Rideau, and Mississippi Rivers but not the Gatineau.



(d) Plants with strongly hirsute spikelets, blades and sheaths are localized along the Gatineau River at Farmer Rapids (*Dore* in 1953) and possibly at Leamy Lake (*Malte* in 1922). These key out to var. *halophilus* (Bickn.) Wieg. f. *lasiolepis* Fern. but their present-day habitat is certainly not saline.

(e) Plants distinctly suffused with red are found along open flood-shores associated with all-green ones and combine the characters of variations b, c, and d above.

(f) A specimen with short-awned lemmas has been collected in 'low ground along streams, Nation River at Casselman' (*Macoun* 29754 in 1884) and reported in *Macoun's Catalogue* and *Fletcher's Flora Ottawaensis* as var. *submuticus* Hook. This station is just beyond the District but it is of interest since this variety is chiefly one of the eastern Prairies in Canada. Map 44.

*E. virginicus* X *E. wiegandii* A hybrid plant claimed to have 100 per cent abortive pollen was found by *Malte* on the "rocky shore of Rideau River at Billings Bridge" in 1922 (*CAN* 118329) and supposed by him to be a cross between *E. canadensis* and *E. virginicus*. In 1953 a similar appearing hybrid with no developing grains was collected, possibly at the same place, "in bushes along rocky bank of Rideau River below White (railroad) Bridge" (*Dore* 15026). *E. canadensis* is not known closer than three miles away but specimens of *E. wiegandii*, apparently of a single plant, have been collected a few hundred yards distant on the opposite side of the river (*Minshall* 3319 in 1943; *Dore* 17320 in 1958). *E. wiegandii* is therefore considered to be one parent and *E. virginicus*, abundant at the site, the other. The hybrid has the pubescent lemmas of the former and the erect spikes of the latter, but in respect to stature, and shape and curving of the glumes it is intermediate.

### 3. *Elymus canadensis* L. CANADA WILD-RYE

Rather scarce; localized along the shore of Ottawa River at Morris Island (*Calder & Gillett* in 1947), Constance Bay (3 collections), Aylmer (*Macoun* in 1911). Since it occurs up the Ottawa as far as Petawawa and around Lake Nipissing, it may have migrated from the shores of the upper Great Lakes along the late post-glacial Nipissing Great Lakes outlet. It has not migrated to what appear to be suitable habitats elsewhere in the District. Map 45.

### 4. *Elymus wiegandii* Fern. WIEGAND'S WILD-RYE

Rare; specimens have been collected at Fairy Lake (*Dore* 101 in 1932), along the Rideau above Billings Bridge at the base of railroad embankment (*Minshall* 3319 in 1943), and along Bear Brook in rich woodland (*Dore* 14717 in 1953); others are known north of the District along Picanoc and Kazabazua rivers, otherwise the main distribution is to the south. Map 46.

## 16. *Hystrix* Moench

Tall, tufted perennial with slender culms and loosely spikeleted, erect spikes. Spikelets 2 at a node, at maturity horizontally spreading and breaking

away readily. Glumes obsolete or present as slender awn-like structures variable in length within the spike. Lemmas with long straight awns. Blades large and broad; sheaths hairless or pubescent; ligule short.

1. *Hystrix patula* Moench BOTTLE-BRUSH-GRASS

A tall, decorative grass of rich woodland, resembling in its spike a long-handled test-tube brush — though a sparsely bristled one; rather scarce in the District at the northern fringe of its range. Its absence from the flat lands of the Ottawa Valley plain may be natural or results perhaps from elimination by clearing and grazing.

Besides the two recognized variations, differences in glaucescence and pubescence of foliage occur in plants in the same habitat:

(a) Forma *patula* -- It has hairless lemmas and is known mainly from the steep woods in igneous locations on the Quebec side of the Ottawa River, extending from Gatineau Park up the Gatineau valley to Kirk's Ferry, Wakefield and Lascelles; on the Ontario side present on a limestone pavement at Taylor's Hill, Westboro. Map 47.

(b) Forma *bigeloviana* (Fern.) Gleason -- It has pilose lemmas and seems to be more widespread, overlapping on the area of f. *patula* in the Gatineau, but extending elsewhere so as to be the only form, represented in 7 specimens, collected around Rockliffe, Beechwood and along the south of the City in rich woods. (Var. *bigeloviana* (Fern.) Deam) Map 48.

17. *Hordeum* L.

Annual or perennial tufted grasses with 3 spikelets (or rudiments of spikelets) at each node of the spike. Spikelets 1-floreted. Glumes and lemmas long-awned (except in some strains of cultivated Barley). Ligule short, membranous.

A. Annual cultivated cereal; spike-axis not breaking up at maturity; body of lemma about 10 mm. long; foliage essentially hairless; distinct auricles present.

..... 1. *H. vulgare*

A. Perennial weed; spike-axis breaking up at maturity; body of central lemma 6 to 8 mm. long; awns long and very slender; sheaths usually densely pubescent; auricles weak or absent. .... 2. *H. jubatum*

1. *Hordeum vulgare* L. BARLEY

One of the important cereal grasses grown throughout the District; stray plants often spring up in barnyards, in dumps or in fields from dropped grains but because of winter conditions such plants cannot perpetuate themselves from year to year through seed.

Many cultivated varieties within the broad species known as *H. vulgare* have been developed through breeding and selection. Of these, Six-rowed Barley with all three spikelets at a node developed and Two-rowed Barley with only the central spikelet developed, are the basic kinds. Hooded Barley, a six-rowed type, has the awns deformed as short hooked processes of distinctive appearance.



2. *Hordeum jubatum* L. FOX-TAIL BARLEY

The first records are from urban or disturbed habitats -- O'Connor St. (Whyte in 1879); Patterson's Creek, Ottawa (Scott in 1891); waste places and roadsides, Blackburn Station (Macoun in 1902); Rockcliffe (Groh in 1909) -- this might indicate that the species was adventive to the District. It was not until about 1940 that the weed made its general appearance in the surrounding terrain of the City, in the agricultural land, along roadside shoulders, and in trampled barnyards especially where the soil was heavy. From Vernon to Winchester, for example, it has come to line the highway in an unbroken stand; yet is essentially absent from the adjoining land. Its natural preference for somewhat saline habitats may be satisfied by the salts which are applied to roads in winter or which accumulate in the soil of barnyards from urine. The spread of Fox-tail Barley within the District, however, has not been as rapid or as extensive as in southwestern Ontario where it is now a most troublesome weed.

Despite the evidence that it is locally adventive, probably from the West but also possibly from the Atlantic coast, its occurrence around some slough-like depressions in the 'Constance Trough' in association with other indigenous species of prairie-flora affinity suggests that it was originally present in the District. Map 49.

The grass has little forage value. Harmful properties are attributed to it because of the sharp-pointed axis-sections which tend to work their way into the eyes and coats of domestic animals through the spring-like action of the slender, rough and flexible awns. Many of the specimens have the awns purple-tinged when immature, though equally whitish when the spike is ripe.

18. *Lolium* L.

Introduced, tufted grasses with loosely spikeleted spikes. Spikelets solitary at each node of the spike-axis, placed with the back of one row of lemmas next to the axis. Second glume (the one away from the axis) only present, except in terminal spikelet where both glumes present. Glumes firm, awnless. Lemmas awnless or slender-awned from tip. Foliage hairless; ligule short, membranous.

A. Perennial; glume shorter than body of spikelet; mature lemmas elliptic-lanceolate, herbaceous in texture.

B. Lemmas awnless; blades folded in vegetative shoots. .... 1. *L. perenne*

B. Lemmas with awns 1 to 8 mm. long; blades inrolled in vegetative shoots.  
..... 2. *L. multiflorum*

A. Annual; glume slightly longer than body of spikelet; mature lemmas ovate-elliptical, firm in texture. .... *L. temulentum*

1. *Lolium perenne* L. PERENNIAL RYE-GRASS

Frequently included in lawn-grass mixtures to give rapid growth the first year; very few plants, however, persist through the winter to grow to maturity in subsequent years. Only two specimens have been prepared for the herbarium:



seeded pasture, South March (*Dore* 352 in 1936); lawn, Driveway, Ottawa (*Dore* 8517 in 1948). Map 50.

## 2. *Lolium multiflorum* Lam. ITALIAN RYE-GRASS

Occurring in new lawn seedings similar to the preceeding. Collected twice in lawns, Ottawa (*Dore* 429 in 1936; *Jenkins* 3710 in 1953). Some workers consider this to be a variety of the above, as *L. perenne* var. *italicum* Parn. Map 51.

*Lolium temulentum* L. DARNEL — This is a serious weed of grain fields in Europe. Seeds have undoubtedly been introduced to most parts of Canada but the plant has nowhere become established. Both the awned variety (var. *macrochaeton* A. Br.) and the awnless variety (var. *leptochaeton* A. Br.) have been cultivated at the Experimental Farm, but have not been known in the wild state in the District.

## TRIBE III. AVENEAE

### 19. *Sphenopholis* Scribn.

Slender, tufted perennial with soft, pale green, generally nodding and more or less contracted panicles. Spikelets 2-floreted, laterally compressed and breaking away beneath the glumes at maturity. First glume straight, 1-veined and very narrow (0.1 mm. broad); second glume broad, obovate and 3-veined. Lemmas awnless, smooth or minutely scabrous. Endosperm liquid in ripe grains. Blades flat, soft; ligule thin-membranous, 1 to 3 mm. long, ciliate or lacerate-fringed. Native.

#### 1. *Sphenopholis intermedia* (Rydb.) Rydb. SLENDER WEDGE-GRASS

A delicate and rather rare grass, mainly confined to sites within a few miles of Ottawa River, and growing in moist crevices in limestone rock, on mossy streambanks, on dripping cliffs (igneous or sedimentary), or in moist deciduous woods. Its size is considerably reduced in the shade but in disturbed soils of new clearings its height may reach 3 to 4 feet.

Most descriptions state that the sheaths and blades are sometimes pubescent. In the District, fourteen of the seventeen specimens collected have foliage devoid of hairs, although scabrous. The other three are pubescent and have been collected along Dow's Swamp, near Breckenridge, and near Hazeldean, growing near or mixed with the hairless plants. The hairs, when present, are quite long and readily visible to the naked eye when viewed in suitable light, so the plants which bear them may be referred to tentatively as of the 'pilose form.' Map 52.

### 20. *Trisetum* Pers.

Tufted perennial grasses with spike-like or loosely contracted panicles and 2- to 5-floreted spikelets. Glumes about equal, or the second slightly longer than the first, and equaling the first lemma in length. Lemma keeled, awned from the back or awnless, acute with the membranous tip sometimes divided into 2 slender teeth; callus and rachilla hairy with straight hairs. Endosperm liquid. Ligule membranous.

A. Panicle spike-like, erect; lemmas with conspicuous bent awns arising from

the back below a 2-toothed apex; culms and sheaths densely short pubescent.

..... 1. *T. spicatum*

A. Panicle loose, its ascending branches nodding; lemmas awnless or with a minute straight awn near the entire tip; culms and leaves hairless. ....

..... 2. *T. melicoides*

### 1. *Trisetum spicatum* (L.) Richter SPIKE TRISETUM

All plants of the District are var. *molle* (Michx.) Beal with hairless glumes. Known only from dry rocks along Gatineau River at Farmer Rapids, Chelsea, Kirk's Ferry and Wakefield, and at Rockcliffe. All the collections, except that made at Farmer Rapids in 1953, date before 1911, and it is suspected that some of the original sites no longer exist. Wide-ranging across Canada. Map 53.

### 2. *Trisetum melicoides* (Michx.) Scribn. MELICA-LIKE TRISETUM

A specimen, collected "on rocks on the island in Gatineau River, Chelsea, July 6, 1903" by Macoun (*CAN* 61297) is the only one extant. Its habitat has since been eliminated by the Chelsea Dam. The specimen is free from hairs on its foliage and hence would be the form typical of the species. Wide-ranging in Eastern Canada, but always scarce. Map 54.

Yellow Oat-grass (*Trisetum flavescens* (L.) Beauv.), a common meadow grass in Europe, has been grown at the Experimental Farm, but is not known to be established in the District.

### 21. *Deschampsia* Beauv.

Slender-culmed, tufted perennials with narrow, mainly basal blades, and very loose panicles of shining, often purplish spikelets. Spikelets 2-floreted, the rachilla extending beyond the upper floret as a bearded appendage. Glumes membranous, about equal, acute, enclosing the florets but persisting after their shedding. Lemmas thin-membranous, toothed at apex, bearded on callus, bearing a slender awn from the back near base. Ligule membranous; foliage hairless; blades narrow.

A. Blades rather rigid, 1 to 3 mm. broad; sheaths smooth; awns straight, exceeding the lemma only slightly; lemmas essentially smooth. .... 1. *D. caespitosa*

B. Spikelets 3 to 4.5 mm. long; plants up to 50 cm. tall, basal blades up to 30 cm. long; native of rocky river banks. .... var. *glauca*

B. Spikelets 2 to 3 mm. long; plant up to 100 cm. tall; basal blades up to 50 cm. long; locally introduced. .... var. *parviflora*

A. Blades thread-like, less than 1 mm. broad; sheaths scabrous; awns twisted, extending well beyond the lemmas; lemmas scabrous. .... 2. *D. flexuosa*

### 1. *Deschampsia caespitosa* (L.) Beauv. TUFTED HAIR-GRASS

(a) Var. *glauca* (Hartm.) Lindm. -- Known only from the rocky south shore of Ottawa River between Lake Deschenes and Rockcliffe, and Gatineau River at Chelsea, Wakefield and Pagan Falls. A widespread native variety.



(b) Var. *parviflora* (Thuill.) Coss. & Germ. -- A single clump persists in open woods along the south shore of Rideau River, about one mile above Billings Bridge (*Dore 13600* in 1951) where it has presumably been planted along with *Molinia caerulea*, *Luzula luzuloides*, etc. An European variety introduced at only a few places in Canada. Map 55.

2. *Deschampsia flexuosa* (L.) Trin. CRINKLED HAIR-GRASS

Known only from the sandy barrens at Constance Bay where it was first collected by Groh in 1938, and from the shallow sandstone near Bells Corners where a few clumps were found by Frankton in 1955. A common species of sandy and granitic areas across Canada, its restricted local occurrence is surprising. Map 56.

22. *Avena* L.

Annual grasses with broad blades and large loose panicles. Spikelets large, 2- to 3-floreted, usually pendulous on slender branches. Glumes broad, equal, glabrous, several-veined, enclosing the florets. Lemmas firm, tough, enclosing the grain, awnless or with short or with large twisted awns inserted about middle of back. Foliage hairless except sometimes for a pilosity on lowermost sheaths and cilia towards base of blades; ligule membranous, long and whitish.

A. Lemma hairless, green or pale-colored; awn generally absent or short and straight, but sometimes the lower floret has a long and twisted awn, the upper florets lacking it; florets separating from glumes and from each other by fracture of the rachilla; rachilla sometimes hairless; foliage hairless. .... 1. *A. sativa*

A. Lemmas generally hairy on back and with a ring of stiff, usually brown hairs from the callus; all lemmas with a strong awn, stiff and twisted in its lower part, the upper part greatly exceeding the glumes; florets readily separating from each other at maturity at a natural abscission layer, leaving a clean circular scar known as a 'sucker-mouth', at the base of the lemma; rachilla hairy. .... 2. *A. fatua*

1. *Avena sativa* L. CULTIVATED OAT

The most common grain grown in the District; not persisting outside of cultivation except around farmyards, stables, dumps and waysides where fresh grains have fallen. Some consider it to be derived through cultivation and selection from Wild Oat or from some common parent. Genetically the two are quite similar and are thought to hybridize giving intermediate forms. (*A. fatua* subsp. *sativa*)

2. *Avena fatua* L. WILD OAT

One of the most serious weeds in the grain-growing regions of Western Canada but not recently encountered in the Ottawa District except at the site of a former city dump on Bronson Avenue where plants were noticed in 1951 and 1952 apparently maintaining themselves (*D.R. Lindsay*). Three specimens have been preserved: Wakefield, in oat fields (*Macoun* in 1903); Ottawa, railway track,



Experimental Farm (*Harrington* in 1905); Leamy's Lake (*Walte* in 1923). Its grains apparently germinate in the fall here (rather than in the spring as in the West) and the seedlings cannot survive the winter; consequently Wild Oat has not become a weed in the District, though its grains have undoubtedly been often introduced as an impurity in feed stuffs and seed grain. Our system of rotation of crops would also seem to prevent the wide-scale establishment of Wild Oat in fields. (*A. fatua* subsp. *fatua*) Map 57.

Tall Oat-grass (*Arrhenatherum elatuis* (L.) Mert. & Koch) is a high-yielding forage grass according to trials at the Experimental Farm but not sufficiently hardy for use in the District; it is more susceptible to winter-killing than *Dactylis glomerata*. No escaped plants have been encountered.

23. *Danthonia* DC.

Densely tufted and shallow rooted perennial grasses with compact or spreading panicles of few spikelets on stiff branches. Spikelets enclosed by the glumes which persist after shedding of florets. Lemmas firm, rounded on the back, inconspicuously veined, sharply 2-toothed at apex and bearing a flattened coiled awn from the back between the teeth, sparsely pilose on the back and with short straight hairs on callus. Foliage hairless or sparsely pilose; sheaths split to base where often swollen by enclosed cleistogamous spikelets, with long hairs on the collar; ligule a row of hairs.

A. Basal blades usually less than 15 cm. long, curling when dead; ligule hairs less than 1 mm. long at center, but 2 to 3 mm. long at sides; sheaths generally pilose; teeth of lemma usually less than 2 mm. long; panicle with branches ascending (before and after anthesis), spike-like. .... 1. *D. spicata*

A. Basal blades over 15 cm. long, not curling on drying; ligule hairs 3 to 6 mm. long; sheath glabrous (except for hairs at collar); teeth of lemma over 2 mm. long, slender; lower panicle branches spreading and often reflexed during and after anthesis. .... 2. *D. compressa*

1. *Danthonia spicata* (L.) Beauv. POVERTY DANTHONIA, POVERTY OAT-GRASS

A widespread native of rocky uplands but often dominating old clearings and worn-out hay fields on sandy or dry land; apparently absent or scarce in the level agricultural lands in the southern part of the District. The densest stand is undoubtedly that in the old meadow in front of the Mackenzie King house at Kingsmere. This large field has probably been closely mowed once or twice a year for many years; it has thereby developed an almost pure sward of Poverty Oat-grass which is in complete balance with the soil conditions. Map 58.

2. *Danthonia compressa* Austin FLAT-STEMMED DANTHONIA

A rare woodland species highly localized in the District and known only from the open woods near the Gatineau River between Farmer Rapids and Chelsea. The exact site of some of the early collections "by the big eddy above Chelsea" is probably now destroyed by damming of the River. The nearest known records are about 50 miles to the east at the mouth of Rouge River, then south of the St.

Lawrence River in Quebec; not known in Ontario. Map 59.

## TRIBE IV. AGROSTIDEAE

### 24. *Calamagrostis* Adans.

Tall, slender, perennial grasses with deep rhizomes. Panicle ample with numerous branches. Spikelets 1-floreted, not flattened, small. Glumes equal, firm, acuminate. Lemma with a fine straight awn arising about the middle of the back and with numerous fine hairs of one half to its full length arising from the callus; rachilla extending behind the palet and bearing similar fine hairs. Foliage hairless; blades narrow; ligule long, membranous, scabrous on back.

A. Callus hairs equaling the lemma; awn almost as fine as the callus hairs; blades over 3 mm. broad; tall plants with panicle open at least at anthesis ..... 1. *C. canadensis*

A. Callus hairs about half as long as the lemma; awn coarser than the callus hairs; blades 1 to 2 mm. broad, usually inrolled; plants up to 50 cm. tall, with contracted panicle. .... 2. *C. neglecta*

#### 1. *Calamagrostis canadensis* (Michx.) Nutt. CANADA BLUE-JOINT

A common species in most parts of Canada and abundant in the District, often forming extensive almost pure stands in swamps and in open moist places such as ditches and flood banks of streams but frequently producing only a few inflorescences. The collections have been made in two sectors, in the lowland below Aylmer and quite close to Ottawa River, and across the upland at a distance of about 15 miles north of the City. Such a pattern is undoubtedly fortuitous. Map 60.

#### 2. *Calamagrostis neglecta* (Ehrh.) Gaertn., Mey. & Scherb.

A species characteristic of subarctic Canada, but represented by a single specimen labeled "lake shore, Aylmer, P.Q., 12 August 1905, J. Fletcher" and originally named "*C. stricta* Trin." Malte revised the specimen to *C. neglecta* but neglected to mention it in his manuscript. The species has never been collected again in the District and, being so far out of its general range, its occurrence is doubtful. Map 61.

### 25. *Agrostis* L.

Tufted or creeping, perennial grasses with rather delicate panicles of small, 1-floreted spikelets. Glumes essentially equal, 1-veined, sharply acute and longer than the lemma. Lemma delicate, hairless, awnless or rarely awned from the back. Palet obsolete or a thin transparent scale half the length of the lemma. Foliage hairless; ligule membranous.

A. Palet present, about half as long as the lemma.

B. Ligule generally 2 to 4 mm. long on lower leaves (longer on the culm leaves), acute or rounded and often frayed at its thin tip; branchlets of panicle ascending at sharp angles from the branches.



- C. Rhizomes present; panicle open after anthesis; blades usually over 3 mm. broad. .... 1. *A. gigantea*
- C. Rhizomes absent, long leafy stolons present; panicle contracted after anthesis; blades usually less than 3 mm. broad. .... 2. *A. palustris*
- B. Ligule up to 0.5 mm. long on the lower leaves, truncate and firm; branchlets of panicle divaricately spreading during and after anthesis. .... 3. *A. tenuis*
- A. Palet absent or very small.
  - D. Lemma awnless; anthers less than 1 mm. long; native, sometimes weedy, species growing in tufts.
    - E. Panicle very diffuse, its coarsely scabrous branches rebranching above the middle and at maturity reflexed from a pulvinus at the base; blades mainly basal, often inrolled, usually less than 2 mm. broad. .... 4. *A. scabra*
    - E. Panicle not widely diffuse, its branches, although fine and spreading finely scabrous and rebranching below or at the middle, not reflexed at maturity; blades scattered along the stem, flat, lax, usually 2 to 4 mm. broad. .... 5. *A. perennans*
  - D. Lemma with a bent awn arising from the back; anthers about 1 mm. long; a fine-turf grass, introduced. .... 6. *A. canina*

# 1. *Agrostis gigantea* Roth RED-TOP

Common throughout the District and abundant in hay fields where it has been sown or has invaded; persisting naturally along roadsides, in pastures and in old neglected fields especially if the soil is sandy and poorly drained; naturalized from Europe. Billings in 1866 and Fletcher in 1880 listed "*A. alba*" for the Ottawa area, but their specimens cannot be found for checking, the earliest specimen extant being that of Macoun from Rockcliffe in 1894. Map 62.

The valid name for this grass has long been a matter of contention. *A. alba* L. is currently in general use in America as it has been for several decades. It is still used in Hitchcock's Manual where a good description and illustration is to be found. The description under *A. alba* in Gray's Manual applies to some other plant. Dr. Malte used *A. stolonifera* L. var. *major* (Gaud.) Farw. for Red-top in his *Commercial Bent-grasses (Agrostis) in Canada* (Nat. Mus. Can. Bul. 50: 123, 1928) and this name is retained in Gleason's edition of Britton & Brown. *A. gigantea* is the name now generally used in Europe and, as pointed out by Philipson (Linn. Soc. Bot. 6: 93, 1937), is probably the correct one. According to Philipson's treatment, our plants are var. *dispar* (Michx.) Philipson.

# 2. *Agrostis palustris* Huds. CREEPING BENT-GRASS

Common throughout the District in roadside ditches, in wet depressions in fields and pastures or on the moist shores of streams and rivers, often growing out into the water of springs. Map 63.



Considerable variation is shown by the plants here classified under *A. palustris*. Most plants of ditches and wet fields have stolons 1 to 2 feet long bearing soft blades 5 to 12 cm. long and about 3 mm. broad. They form dense, leafy, matted patches often with only a few stems turning up to terminate in panicles. These plants may be adventive. Other plants form less extensive patches and produce numerous flowering culms, and may be native. Around the City and in residential areas, some plants with shorter and more densely tufted stolons bearing stiffer and shorter blades are to be found, possibly originating from lawn or fine-turf plantings to Metropolitan or Washington Bent, two popular commercial selections. The panicles of these latter strains are generally smaller, more slender and more compactly flowered; seldom are they produced in abundance and consequently for turf these selections are generally propagated vegetatively. They will persist on well-drained or uniformly drained soil but can be maintained only with special care.

- Various names have been applied to this species-complex: *A. maritima* Lam.; *A. alba* L. var. *palustris* (Huds.) Pers.; *A. stolonifers* (L.) Koch; *A. stolonifera* L. var. *compacta* Hartm.

### 3. *Agrostis tenuis* Sibth. BROWN-TOP, COLONIAL BENT-GRASS

Often seeded for lawns and fine-turf but apparently not well adapted to the ordinary lawn conditions of the District since it occurs only sparingly, usually only in moist, partly shaded lawns. Only five specimens have been collected: at Buckingham in 1923, in Ottawa South, in the Arboretum, near the Rideau at Uplands, and on the King Estate, the last four after 1948. Introduced from Europe, it has not escaped to roadsides, pastures and waste places as it has in the Maritime Provinces, where ubiquitous, and where commercial seed was at one time produced as "Prince Edward Island Bent". (*A. vulgaris* With.; *A. alba* L. var. *vulgaris* Thurb.) Map 64.

### 4. *Agrostis scabra* Willd. TICKLE-GRASS

Common on shallow soil on rock or on gravelly land, becoming very abundant after fires or after clearing, also found on sandy roadsides or in thin pastures on poor soil. A native tumbleweed; probably found throughout the District; flowering in July. Formerly confused with *A. hyemalis* (Walt.) B.S.P., a southern species not known to occur in Canada. Map 65.

### 5. *Agrostis perennans* (Walt.) Tuckerm. AUTUMN BENT-GRASS

Abundant along the flood shores of Ottawa and Gatineau Rivers, extending far beyond the limits of the District along the Ottawa and at least to Gracefield up the Gatineau. A recent collection from near Almonte indicates that it may be along the Mississippi also. It is apparently absent from the shores of other rivers and streams. Specimens have also been collected inland from the rivers at a small lake 6 miles east of Wakefield and at McGregor Lake, and in wet woods on the plain south of the Ottawa at four points: Carlsbad Springs, Navan, Manotick and Merivale. Map 66.

In shaded and crowded habitats, the plants are very slender with fewer, green (rather than purple) spikelets on weak and flexuous panicle branches. A native species, flowering later than the others, beginning bloom in August and continuing into September.

Three collections made at Aylmer or nearby Wychwood by Dr. Malte appear intermediate between *A. perennans* and *A. scabra*, and maybe hybrids. The panicle branches are too short for *A. scabra*; the stage of development shown by the specimens indicates a flowering period earlier than *A. perennans*. Malte labeled the specimens tentatively "*A. hyemalis* X *A. stolonifera*".

6. *Agrostis canina* L. VELVET BENT-GRASS

Our only specimen of this species is a fragmentary one collected by Malte at "Ottawa Golf Club" in 1923. Presumably the site is the Royal Ottawa Golf on the Aylmer Road rather than the Ottawa Hunt and Golf Club at Uplands. This is a fine-leaved and delicate species used for golf greens and is probably more prevalent than the preserved material would indicate. It, however, does not survive in the wild at Ottawa. Introduced from Europe. Map 67.

26. *Cinna* L.

Tall, slender, tufted perennials with broad soft leaves and large nodding panicles of small spikelets. Spikelets 1-floreted, flat, breaking away complete below the glumes. Glumes scabrous, slender, almost equal in length and width. Lemma almost equaling the glumes, scabrous, on a very short basal stalk and with the rachilla prolonged above as a minute bristle, midvein extending into a short (up to 1 mm.) straight awn just below tip of lemma. Palet appearing 1-veined. Stamen one. Foliage hairless; ligule long and membranous.

A. Spikelets (exclusive of awns) 4.5 to 6.0 mm. long; panicle densely flowered, its branches rather stiff. .... 1. *C. arundinacea*

A. Spikelets 2.5 to 4.5 mm. long; panicle loosely flowered, the slender branches flexuous and drooping. .... 2. *C. latifolia*

1. *Cinna arundinacea* L. STOUT WOOD-GRASS

A rare species of rich woods, reaching its northern limit in the District; represented by five collections made before 1903, then one in 1933 at Billings Bush by Minshall; now probably extinct, or being eliminated through clearing and grazing. Map 68.

2. *C. latifolia* (Trev.) Griseb. DROOPING WOOD-GRASS

A widespread species in Canada and quite common in the District; characteristic of moist woods and recent clearings especially in the hilly terrain north of the River. No specimens have been made in the south western quadrant and it may actually be absent there. Map 69.

27. *Alopecurus* L.

Perennial, non-rhizomatous grasses with dense, cylindrical, spike-like



panicles, much resembling those of *Phleum* but softer to the touch. Spikelets laterally flattened, 1-floreted. Glumes equal in size and shape, joined together at the base, long pubescent especially on the keels. Lemma shorter than the glumes, thin, awned from the back. Palet absent. Foliage hairless, often glaucous; ligule membranous.

A. Spikelets 2 to 3 mm. long; panicle 3 to 6 mm. thick; awns not conspicuously exerted; anthers about 1 mm. long. .... 1. *A. aequalis*

A. Spikelets about 5 mm. long; panicle 7 to 10 mm. thick; awns conspicuously exerted; anthers 2.5 to 4.0 mm. long. .... 2. *A. pratensis*

#### 1. *A. aequalis* Sobol. SHORT-AWN FOX-TAIL

A widespread native of pools, shorelines and temporary ponds across Canada; rather scarce in the Ottawa District, mainly along the shore or near Ottawa River above the City. Map 70.

#### 2. *A. pratensis* L. MEADOW FOX-TAIL

A valuable forage species; rather common in Nova Scotia but very scarce in Quebec and Ontario where it apparently cannot withstand the dry summer conditions. The well-known stand in the low meadow in the Arboretum has persisted for many years and has expanded from an original seeding—possibly about 1910. However, the first specimen from this area is dated 1937. Subsequently a few other establishments have been recorded: Bear Brook, roadside (*Groh* in 1937); Heron Road, roadside (*Groh* in 1946); near Pine Crest Cemetery, a few clumps on roadside (*Dore & Breitung* in 1948); Billings Bridge, a single plant in ravine (*Dore* in 1951); Almonte, in low meadow (*Dore* in 1953); also seen in meadows near Gatineau Point and Rockland. The plant flowers in the last week of May, about two weeks ahead of Timothy, and by some is mistaken as 'early-flowering Timothy'. Its early flowering makes its presence conspicuous, consequently if Meadow Fox-tail was more abundant in the District, many more localities would now have been recorded. Map 71.

### 28. *Phleum* L.

Perennial, growing in tufts from hard corm-like bases. Panicle cylindrical, dense and spike-like, rather firm and harsh to the touch, its numerous spikelets on very short branches. Spikelets 1-floreted, flat. Glumes equal, united only at the base, awn-pointed, coarsely ciliate on the keels. Lemma thin, awnless, much shorter than the glumes. Palet present, but delicate and transparent. Foliage completely hairless except for a few cilia on the collar of blade; ligule white, membranous, generally notched at each side.

#### 1. *Phleum pratense* L. TIMOTHY

A common and valuable forage grass; the most extensively planted hay species, generally sown in mixture with clovers in the regular farm rotation and doing best on moist but well-drained soil; persisting and often dominating roadsides, old fields and poorly grazed pastures throughout the District. A good pasture



species, productive and palatable, but usually dying out under conditions of continuous close grazing; not desirable as a lawn species because of its coarseness, tufted growth and pale color. Map 72.

Although found almost everywhere, only 36 specimens have been preserved. These have been collected from widely spaced localities and often from unusual habitats such as woodland paths and rocky shores where its depauperate condition has suggested *P. alpinum*, an arctic-alpine species not present in the District. The ripe grains of Timothy are able to resist animal digestion and are therefore transported to any place where cattle may wander. In open habitats the plants come into their peak of bloom soon after the middle of June. For example, on June 23, 1955, at 10 A.M. Standard Time, a cloud of pollen was seen to rise on a sudden gust of wind from a Timothy meadow in full anthesis near Wakefield. A second flowering often takes place in September from the aftermath of hay.

29. *Muhlenbergia* Schreber

Perennial grasses, usually with short, scaly, shallow rhizomes and slender hard culms. Inflorescence a dense, congested and spike-like panicle, rarely (in *M. uniflora*) delicate and diffuse. Spikelets 1-floreted, not flattened. Glumes (exclusive of awn-tip when present) usually shorter than the floret, membranous with only the green midvein prominent, keeled. Lemma membranous, generally flecked with a gray or greenish color, sometimes uniformly gray, acute, awnless or long awn-tipped, usually pilose. Foliage hairless, scabrous; ligule membranous, ciliate. Large bulb-like insect galls ("turions") often present on lower parts.

A. Short scaly rhizomes present (spreading shallowly in the humus and pulling up with the stem); blades usually over 3 mm. wide; panicle dense, often interrupted, spike-like; plants generally over 30 cm. tall.

B. Plant branching and possessing several to numerous inflorescences; panicles rather soft and arching with evident branches; glumes shorter than or equaling the lemma-body; anthers less than 0.5 mm. long.

C. Culm internodes hairless, smooth, often glossy; stems often zig-zag, freely branching and becoming bushy and sprawling, often rooting at the lower nodes; panicle generally partly included in its flattened, loose, subtending sheath; grain rather easily loosened from its lemma. ....

..... 1. *M. frondosa*

D. Lemma awnless. .... 1(a). forma *frondosa*

D. Lemma long-awned. .... 1(b). forma *commutata*

C. Culm internodes minutely but densely hispidulous, rough, generally dull; stems erect with numerous ascending branches bearing well-exserted panicles; sheaths cylindrical and close. .... 2. *M. mexicana*

E. Lemma awnless. .... 2(a). forma *mexicana*

E. Lemma long-awned. .... 2(b). forma *setiglumis*

B. Plant usually with a solitary culm and terminal panicle; panicle firm and

somewhat bristly, erect and spike-like with short, stiff branches, sometimes interrupted at base; glumes long awn-pointed, longer than the lemma; lemma awnless; anthers 1.0 to 1.5 mm. long. .... 3. *M. glomerata*

A. Scaly rhizomes absent; plant mat-forming due to branching of its slender prostrate culms; blades 1 to 2 mm. broad; panicle delicate, with its minute spikelets on long, spreading branchlets; plants usually less than 30 cm. tall; rare, in bogs. .... 4. *M. uniflora*

### 1. *Muhlenbergia frondosa* (Poir.) Fern.

A rare and localized species extending up the Ottawa Valley to its northern limit on the shores of the River at Parliament Hill and of the Gatineau at Farmer Rapids. Thirteen specimens have been collected, six of the typical awnless form and seven of the long-awned form -- at least at three sites both forms growing together. Abundant seed seems to be produced, but the pattern of distribution suggests that spread results solely from transport of rhizomes by flood waters. Map 73.

(a) forma *frondosa* -- Farmer Rapids, Leamy Lake, Kettle Island, Orleans and Cumberland.

(b) forma *commutata* (Scribn.) Fern. -- Leamy Creek, Kettle Island, Rockcliffe, Buckingham, Orleans and Bourget. The precise locality and habitat of the 'Buckingham' collection (*Malte 594*) is not stated but is presumed to be near the mouth of the Lievre, a few miles below the town. The 'Bourget' collection is from the bank of Bear Brook (*Dore* in 1953).

### 2. *Muhlenbergia mexicana* (L.) Trin.

A species of wide distribution in the District and represented by many more specimens than *M. frondosa*. An abundant and characteristic species of rock or gravel beaches washed by the higher flood waters of the rivers; probably confined to such habitats originally.

(a) forma *mexicana* -- More common than the awned form and of wider distribution in the District and beyond. It has spread away from the riverbanks in post-settlement times and now is found in a wide range of habitats, even becoming a weed in gardens and waste land. Map 74.

(b) forma *setiglumis* (S. wats.) Fern. -- Still confined to rocky flood shores and often growing near the typical form, but along Mississippi River, where collected at four points (Appleton, Blakeney, Pakenham and Galetta), it apparently is the only form. Elongated plants of this form from shaded habitats have been erroneously identified as *M. sylvatica*. Map 75.

### 3. *Muhlenbergia glomerata* (Willd.) Trin. var. *cinnoides* (Link) Hermann

Probably the most far-ranging species of *Muhlenbergia* in Canada and characteristic of boggy areas temporarily flushed with water, but of rather scarce occurrence within the District; present in wet habitats, especially in those where peaty soil borders a stream or lake, or in depressions in the rock where spring-time waters lie. Map 76.



4. *Muhlenbergia uniflora* (Muhl.) Fern.

An abundant species in Newfoundland and Nova Scotia, extending across interior Quebec to Ontario and extending southward into the District to occur at only one point — in a bog along a northward-flowing stream in the upland north of Eardley. A delicate and inconspicuous species, curious among grasses by its habit of 'infra-nodal' branching. Map 77.

30. *Sporobolus* R.Br.

Annual or perennial grasses with panicles of small 1-floreted spikelets. Glumes and lemma 1-veined. Palet as long or longer than the lemma, generally splitting down the back. Blades slender, long taper-pointed; sheaths pilose at top; ligule a row of hairs.

A. Weakly rooted annuals, generally less than 40 cm. tall; panicles meager, slender, enclosed within the inflated sheaths, the terminal sometimes exserted; grain elliptical, loosely enclosed by palet.

B. Spikelets 2.0 to 3.0 mm. long; lemma and palet smooth, white or suffused with red-purple, about equal in length. .... 1. *S. neglectus*

B. Spikelets 3.5 to 6.5 mm. long; lemma and palet minutely pubescent; lemmas generally flecked with drab green, the exposed ones purple. .... 2. *S. vaginiflorus*

A. Firmly rooted, densely tufted perennial, over 40 cm. tall; panicles exserted, spreading, ample; spikelets 4.0 to 6.0 mm. long; grain globose, splitting the palet and spreading the glumes, becoming exposed. .... 3. *S. heterolepis*

1. *Sporobolus neglectus* Nash OVERLOOKED DROP-SEED

A small, pale green annual often with red culms, apparently abundant in the District but generally given little attention because it appears sterile. Viable grains, however, are always produced inside the inflated terminal or lateral sheaths in late summer, even in depauperate plants only half an inch high. Under good conditions the terminal panicle may protrude slightly, but in any case, the flowers are cleistogamous and generally lack stamens, an anther having been found only on one specimen (from Shirley Bay).

Originally restricted to open habitats on the shingle beaches and limestone pavements along the flood shores of Ottawa River and on shallow soil over bedrock such as at Nepean Point where the early collections were made (*Fletcher* in 1879 and 1880, *Scott* in 1891, *Macoun* in 1894). It is now spreading as a weed to bare places in pastures and roadsides. A favorite habitat is in roadside ditches cut down to a level bottom of limestone. The plant grows in the thin layer of soil flooded in spring and highly desiccated in summer. Under treading or rolling the plants become prostrate and rather coarse and succulent, as on bridgeways. Map 78.

2. *Sporobolus vaginiflorus* (Torr.) Wood ENCHEATHED DROP-SEED

Indistinguishable from the preceding in early stages and without the aid of a



good lens when mature; apparently less frequent in the District, not being collected before 1935. Like the former (native but spreading rapidly to dry fields) it is adapted to desiccated excavations and gravel shoulders of pavements, and often grows mixed with *neglectus*. Both species form distinctive light-green patches in these special locations.

All plants north of the United States have been considered to be var. *inaequalis* Fern. (Rhodora 35: 108-109, 1937) with an elongated, taper-pointed palet. Specimens from Merivale, Bells Corners, Carp and Wilson's Corners are of this variety. However, plants collected along the Mississippi River at Galetta (*Dore & Groh* 5069), on shallow limestone soil at Kinburn (*Dore & Groh* 5072) and along the Ottawa River shore at Shirley Bay (*Groh* 3394; *Dore* 14035, 14094) have subequal palets and lemmas indicating the typical species (var. *vaginiflorus*). Some plants (*Dore* 14037B), separated from a collection of anther-bearing *S. neglectus* from Shirley Bay, appear partially sterile and may be of hybrid nature. Map 79.

Impoverished plants, due possibly to extreme changes from flooding to drying of the soil or to close crowding, are very slender; dwarfed and unbranched. In these the sheaths are pale and considerably inflated by the enclosed cleistogamous panicles. These plants, found in both *S. neglectus* and *S. vaginiflorus*, while distinctive, are likely ecological forms but require observation under controlled conditions.

### 3. *Sporobolus heterolepis* Gray NORTHERN DROP-SEED

A prairie species reaching its northeastern limits in the Ottawa Valley and very rare anywhere in Ontario and Quebec. Restricted to dry limestone pavements or sandy flood plains along the River, where probably a relict from the 'Xerothermic Invasion'. Known only from Little Chaudiere (*Fletcher* in 1877) where now probably extinct, Morris Island (*Cody et al.* in 1947), and Ennis point (*Dore & Breitung* in 1948), but also from Norway Bay and Pontiac slightly farther upstream. Map 80.

*Sporobolus cryptandrus* (Torr.) Gray, the SAND DROPSEED — Known beyond 60 miles of Ottawa at Fort Coulonge, Allumette Island and Petawawa where it is abundant, at Maberly Station where it has established along the railroad, and near Oka. A sporadic individual sprang up along the greenhouse in the Arboretum in 1936 (*Dore* 403) but is not otherwise known in the District. It would undoubtedly spread rapidly at Constance Bay and on other dry sand deposits if introduced.

### 31. *Brachyelytrum* Beauv.

Slender perennial, 2 to 4 feet tall, growing in loosely rooted patches from short rhizomes which retain the bases of the old culms. Panicle contracted, nodding, few-spikeleted. Spikelets 1-floreted, slender, breaking away while still green and leaving the minute glumes on their short but slender pedicels. Lemma long-awned, strongly veined and scabrous; rachilla extending beyond the floret as a bristle about as long as the body of the lemma. Stamens two; anthers 3 to 4 mm. long. Foliage pilose; blades 10 to 15 mm. broad, about 10 cm. long, lanceo-

late; ligule membranous, 1 to 2 mm. long, its margin toothed.

1. *Brachelytrum erectum* (Schreb.) Beauv. BEARDED SHORT-HUSK

The common name refers to the long-awned, but short-glumed, spikelets. Two varieties are recognized:

(a) var. *erectum* — The lemmas are hispid with setae 0.2 to 0.6 mm. long. Widespread to the south of the District, it has been found only in a sandy deciduous woods near Manotick Station (*Dore 14367* in 1953).

(b) var. *septentrionale* Babel — With scabrous lemmas, this characteristic shade plant is quite common in dry rocky woods. It probably occurs throughout the District although not represented by collections from much of the southern half; clearing of woodland and grazing have undoubtedly eliminated it from many sites. Map 81.

32. *Milium* L.

A tall, broad-leaved woodland species, 3 to 6 feet high from a tufted base. Panicle widely open, with the few spikelets near the end of the branches. Spikelets 1-floreted, 3 mm. long. Glumes broad, rounded on the back, equal. Lemma smooth and shining, awnless, partly embracing the pale and enclosing the grain. Foliage hairless and usually glaucous; blades 1.0 to 1.5 cm. broad and 15 to 20 cm. long; ligule membranous, 4 to 8 mm. long.

1. *Milium effusum* L. WILD MILLET-GRASS

An attractive and early maturing grass of rich deciduous woodland, now rather scarce in the District where it was probably more extensive before the clearing, burning and grazing of the woods, but still to be found in the relatively inaccessible slopes in Gatineau Park from Chelsea to Breckenridge. The old stations at Britannia, Mackay's Lake and Fairy Lake are probably now extinct. The farthest known locality directly northward is along Picanoc River, although it reaches slightly higher latitudes at LaTuque and in Algonquin Park.

Our plants are slightly different from those of northern Europe and have been named var. *cisatlanticum* by Fernald (*Rhodora* 52: 208, 1950). Map 82.

33. *Oryzopsis* Michx.

Native perennial grasses, tufted, with open or contracted, sparsely spikeleted panicles. Spikelets 1-floreted. Glumes broad, rounded on the back, equal and as long as the body of the lemma. Lemma rounded on the back, firm and appressed pubescent, its margins enfolding the pale and grain. Awn deciduous, sometimes by flowering time. Blades coarse, deeply ridged above, inrolling rapidly on drying or permanently involute. Ligule short, membranous.

A. Lemmas (exclusive of awn) 6 to 9 mm. long; awns 5 to 15 mm. long; blades over 4 mm. broad, flat when fresh.

B. Blades mainly basal, scabrous above, wintergreen: blades of culm leaves greatly reduced; lemma white, pale straw-colored or tinged with purple



at maturity. Spring flowering..... 1. *O. asperifolia*

B. Blades mainly cauline (basal blades reduced), densely short-pilose above; mature lemma dark brown or black. Summer flowering. .... 2. *O. racemosa*

A. Lemmas 2 to 4 mm. long; awns about 2 mm. long, absent at flowering time; Blades involute, less than 3 mm. in diameter. .... 3. *O. pungens*

1. *Oryzopsis asperifolia* Michx. WINTER-GRASS, ROUGH-LEAVED MOUNTAIN-RICE

A characteristic woodland species flowering in May and early June, the naked culms then spreading from the crown of dark wintergreen blades; new leaves do not develop until midseason. Abundant in mixed woods, flourishing after clearing, especially on sandy soil or over the granite, but also present in the limestone regions at Ottawa or at Almonte and Peirces Corners. The four earliest collections, between 1879 and 1884, were made in Stewart's Woods, now the central part of the City. It has not been collected in the southeastern quadrant of the District and its absence there, if valid, would be strange since it is of widespread occurrence in Canada. Perhaps it had completed its migration when the Ottawa Sea covered this sector. Map 83.

This grass is known as "Winter-grass" to old-time residents in the vicinity of Kazabazua, Que., because the leaves remain green underneath the snow and provide some fodder in the first days of spring for deer and for cattle. The name is appropriate and not known to be used for any other species of plant, so is taken up here as an alternate common name.

2. *Oryzopsis racemosa* (J.E. Smith) Ricker MOUNTAIN-RICE

A tall attractive species coming into bloom in mid- to late-summer. It prefers dry soil in rich woods, frequently growing out of crevices in limestone pavement, but also grows in the Precambrian upland north of the River; abundant in the McGregor Lake and Gatineau Park areas it reaches its farthest northern limit at Danford Lake and Lac du Petit Poisson Blanc, both about 10 miles beyond the District. Map 84.

3. *Oryzopsis pungens* (Torr.) Hitchc. SHARP-LEAVED MOUNTAIN-RICE

A characteristic northern and western species of open pine and spruce woods on acidic rocks or sand plains, but very restricted within the District. Abundant on the sandy fire-barren at Constance Bay and around Aylmer and Harwood Plains where, however, it is on land underlain by limestone. Map 85.

A closely related species, *O. canadensis* (Poir.) Torr., is found throughout much of northern Quebec coming south only as far as the burnt-over sand plain at Kazabazua just outside the District.

## TRIBE V. CHLORIDEAE

34. *Spartina* Schreb.

Tall perennial with coarse, scaly and sharp-pointed rhizomes and tough, slender-tapered leaves. Inflorescence of several 1-sided spikes, ascending or

appressed to the axis and overlapping in a slender raceme. Spikelets 1-floreted, laterally flattened and nesting closely one against the other. First glume about as long as the lemma, the second much longer and slender awn-pointed; both glumes harshly scabrous on the keel. Lemma blunt, often exceeded slightly by the palea. Blades broad at the base but inrolling quickly on wilting, hairless. Ligule a row of soft hairs, 1 to 3 mm. long, fused together at their base.

#### 1. *Spartina pectinata* Link TALL CORD-GRASS

Confined to the upper flood shores of Ottawa River, where it often forms dense stands, and to the lower parts of some of its tributaries. It extends up Mississippi River about 3 miles to Galetta, up the Gatineau 20 miles to Wakefield and up the Rideau only as far as the rapids below Hog's Back. The stand at Constance Lake is on an ancient side-channel of the Ottawa.

In the District the plant produces few if any viable grains though flowering profusely during August. This sterility is reflected in its localized and concentrated occurrence. Its spread is vegetative by coarse shallow rhizomes and consequently the clones it forms are remarkably circular in sites where radial growth is unimpeded. Masses of the sod are evidently loosened from the shore by flood waters and ice in the spring and are carried downstream. The stands appear to be most prevalent in bays where the sods might lodge in the backwaters. The stands up the tributaries probably date from the time when the Ottawa flowed over a greater area. It is not certain by what route the plant got into the Ottawa drainage; perhaps from the West via Lake Nipissing, but there appears to be a gap in its distribution between North Bay and Petawawa. Map 86.

### TRIBE VI. PHALARIDEAE

#### 35. *Hierochloë* R. Br.

Low perennial with long deep rhizomes producing leafless flowering stems early in the season and vegetative shoots of long sweet-scented leaves from a different point later on. Panicle open, slender-branched and few-spikeleted. Spikelets golden brown, shiny, with one fertile floret between two larger sterile florets. Glumes broad, equal, hairless, thin. Lemma of staminate (sterile) florets broad and thin, hairy along the margins; lemma of fertile floret firm, hairless. Foliage hairless; ligule membranous.

#### 1. *Hierochloë odorata* (L.) Beauv. SWEET-GRASS

A wide-ranging grass in the North; scarce in the District and localized in patches along sandy or gravelly shores of Ottawa River or at points on its former channels such as Constance Lake, Billings Bridge, and Lake Flora in Hull; stations at points farther removed from the Ottawa are near MacGregor Lake, near Navan and Manotick Station. The patches appear to be pure clones and under present conditions the species does not seem to be spreading by seed. The old stands at Blueberry Point (1903) and Lake Flora (1897) are probably now extinct. The largest stand is undoubtedly that northwest of Navan said to extend for half a mile along a sandy roadside (*Bassett & Mulligan* in 1952). Map 87.



An individual stem from the patch along the rapids above Billings Bridge has unusually elongated and capillary panicle branches (*Dore 14218* in 1953).

This is the grass formerly much used by the Indians for weaving of scented baskets. Its long, tough and flexible secondary blades which roll in on drying are particularly suitable for the purpose and continue to give off their fragrance for years.

### 36. *Anthoxanthum* L.

Tufted perennial, sweet-scented when dry, with soft, green or golden brown spike-like panicles. Spikelet composed of one fertile floret above 2 sterile reduced florets. Glumes unequal in length, acute and thin, the second somewhat wrapped around the whole spikelet. Lemma of sterile florets reduced to a brownish hairy scale bearing a long awn from its back; lemma of fertile floret shorter than that of sterile florets, hairless, awnless, shiny and darker colored. Foliage shortly soft-pubescent, the margin of the blade collar longer pilose; ligule membranous.

#### 1. *Anthoxanthum odoratum* L. SWEET VERNAL-GRASS

Widespread in the Atlantic provinces and an abundant weed in some old meadows in Nova Scotia but apparently the climatic conditions beyond southern Quebec in Central Canada are not suitable for its persistence. In the District a few plants have been known in the Arboretum, in a moist meadow by the Canal, since 1944, but they have not increased as has the associated *Alopecurus pratensis*. The two early specimens (*Whyte* in 1892; *Fletcher* in 1892) from cultivation are thought not to represent the source from which the Arboretum plants originated. The occurrence in Beechwood Cemetery (*Macoun* in 1911) probably no longer exists. Map 88.

A European species, introduced probably frequently in the past in lawn or meadow mixtures. The bitter taste of the plant when fresh makes it unsuitable for grazing, and the stems when dry, although fragrant like Sweet-grass, are too slender and brittle for weaving.

### 37. *Phalaris* L.

Perennial or annual grasses with large terminal spike-like panicles. Spikelets flattened and containing a perfect floret between two scale-like rudimentary florets. Glumes equal in length and surpassing the florets. Lemma of the perfect floret awnless, smooth and firm, readily shelling out of the spikelet with the grain enclosed. Foliage hairless; blades broad; sheaths split to base; ligule long, white and membranous.

- A. Annual; panicle ovate, dense and firm; glumes broad-winged on the keel, white with green stripes. .... 1. *P. canariensis*
- A. Perennial, spreading by rhizomes; panicle elongate and flexible, its branches spreading at flowering time; glumes keeled but not broad-winged, pale green or purplish fading to straw-colored. .... 2. *P. arundinacea*

1. *Phalaris canariensis* L. CANARY-GRASS

Formerly the main constituent of 'bird seed' of commerce; several specimens have been collected around the City since 1879, usually in dumps or along streets where they have sprung up from discarded seed. The plants reach maturity early but their grains seem unable to survive the winter; consequently, it has not become a weed. Its appearances have become less frequent in recent years, the last specimen, in 1948, coming from a fresh road grade at Westboro (Groh 3893). Map 89.

2. *Phalaris arundinacea* L. REED CANARY-GRASS

A valuable forage grass, becoming more popular in the last decade as a pasture and hay species because it is highly productive and suitable for wet land. Large dense stands now grow wild on muddy flood banks and in marshes along the Rideau at Billings Bridge, and along the Ottawa below the City where they are spreading rapidly and excluding other vegetation. A large stand occupies a wet trough extending southwest from Woodroffe for about half a mile; another occurs west of Bells Corners. Other stands occur along Jock River above Richmond and in rocky pools near Harwood Plains. At the latter site the plants may be of native origin, but at the other sites they have undoubtedly developed from commercial seed, probably of some alien strain since they are more vigorous and the patches exhibit considerable variation in form and color. Map 90.

2(a) forma *variegata* (Parnell) Druce RIBBON-GRASS — A favorite foliage plant in old gardens, now found in ditches and dumps throughout the countryside; frequently persisting at the site of old homesteads long after the buildings have gone. The present stand in the roadside ditch at Chelsea is probably the same one collected by Groh in 1910 and Malte in 1911.

The blades are heavily streaked with white and during spring and early summer make a distinctive display, but later in the season the leaves from the same clump are sometimes fully green. This variegated form flowers less frequently than the typical form and does not seem to come true from seed. (var. *picta* L.)

TRIBE VII. ORYZEAE

38. *Leersia* Swartz

Native perennials with scaly rhizomes and sparsely branched panicles. Spikelets 1-floreted, strongly flattened laterally, overlapping and appressed to the capillary panicle branches. Glumes absent. Lemma broad, boat-shaped, firm, scabrous, awnless. Palea equal in length and similar in texture to the lemma. Blades broad; the nodes and often the whole plant bristly-hairy; ligule membranous.

A. Lower panicle branches more than one at a node; spikelets about 5 mm. long.  
..... 1. *L. oryzoides*

A. Panicle branches all single; spikelets about 3.5 mm. long. .... 2. *L. virginica*

1. *Leersia oryzoides* (L.) Swartz RICE CUT-GRASS

A harsh-scabrous and clinging grass characteristic of ditches, marshy shores and wet depressions in the open; common around Ottawa and probably throughout the District. Map 91.



In its typical form this grass has stems 2 to 3 feet long and forms dense, tangled and yellow-green masses in wet places. The spreading panicle becomes well extended from the upper sheaths at the start of bloom in late July. The plants are well anchored in the wet soil and consequently specimens in the herbarium usually lack roots and rhizomes.

Along the floodshores of rivers and streams where the land is inundated for a time, the plants are smaller and develop a darker green color, often with purplish sheaths. The panicles seldom become exserted from the sheaths, and their florets, ripened cleistogamously, remain still enclosed to the latter part of summer. Such plants, in contrast to those mentioned above, generally grow in shallow water or among water-washed stones on the shore. They can be pulled up easily and preserved specimens usually show the complete underground system. Specimens of this kind have generally been labeled "*forma inclusa* (Wiesb.) Dorfl." (or "*forma clandestina* Eaton") but they are undoubtedly only an ecological phase of the species developed under water-logged conditions. In wet seasons (such as that of 1947) or when spring flooding is more prolonged, this phase predominates but since the plants appear to be sterile, specimens are less frequently collected.

Plants with smooth stems and foliage have been described as *forma glabra* Eaton (Rhodora 5: 118, 1903). Such plants are usually found completely submerged in water and considerably dwarfed. However, when their tips extend above the water line, they produce cleistogamous flowers and develop scabrous sheaths on the emerged portion. A specimen of this intermediate ecological phase has been collected in Leamy Lake (*Dore & Breitung* 47.1288). Until it can be shown that such phases ("*forma inclusa*" and "*forma glabra*") have a genetic basis, they should remain unnamed.

Although recognized as a perennial, this grass appears to be able to produce flowers in its seedling year. At least, turf-like masses of small plants 2 to 4 inches tall, arising from seeds (remnants attached) and fruiting, were encountered in the saturated mud along Leamy Lake on September 13, 1947 (*Dore & Calder* 47.1108).

## 2. *Leersia virginica* Willd. WHITE-GRASS

Not widespread in District, but where present, as in the alluvial woods of Silver Maple along the Ottawa, usually abundant; restricted to flood flats along Ottawa River or the lower reaches of its tributaries, as at Shirley Bay, Rockcliffe and Kettle Island along the Ottawa, at Farm Point, Farmer Rapids, Ironside and Leamy Lake along the Gatineau (recently found at Kazabazua 40 miles up the Gatineau), at Billings Bridge on the Rideau, at Galetta on the Mississippi, and near Bourget on Bear Brook; also found at Fairy Lake and Mackay Lake. Map 92.

Our plants have lemmas with cilia about 0.2 mm. long and might be classified as the scarcely distinct var. *ovata* (Poir.) Fern.

## TRIBE VIII. ZIZANIEAE

### 39. *Zizania* L.

Tall, annual aquatic grasses with broad blades and septate culms. Inflorescence a loose panicle with the unisexual 1-floreted spikelets on different branches. Staminate spikelets, borne on the capillary and spreading branches in the lower part of the panicle, have thin lemma and palea which spread at anthesis to expose the 6 large stamens, then fall off. Pistillate spikelets are erect on thick pedicels on erect or ascending branches and have a rather firm and long-awned lemma. Glumes absent. Foliage hairless; ligule long, membranous.

- A. Pistillate lemmas papery, dull, minutely and sparsely scabrous all over; lemmas of those spikelets not producing caryopses less than 1 mm. thick. .... 1(a). *Z. aquatica* (var. *aquatica*)
- A. Pistillate lemmas firm and tough, lustrous, smooth between the sunken veins; lemmas of sterile florets with body of same thickness as fertile, 1.5 to 2.0 mm. thick.
  - B. Plants 70 to 150 cm. tall; blades 0.4 to 1.2 cm. broad with ligules 3 to 5 mm. long; lower pistillate branches bearing 2 to 6 spikelets; lower or middle staminate branches with 1 to 15 spikelets. .... 1(b). var. *angustifolia*
  - B. Plants 90 to 300 cm. tall; blades 1 to 4 cm. broad with ligules 10 to 15 mm. long; lower pistillate branches with 11 to 29 spikelets; lower or middle staminate branches with 30 to 60 spikelets. .... 1(c). var. *interior*

#### 1. *Zizania aquatica* L. WILD-RICE

The large black grains of Wild-rice are known to provide good food for wild fowl. Consequently, seeds from various sources have been planted by hunters in many aquatic sites to attract ducks; it is now becoming difficult to determine which stands in the District are original. Three varieties as distinguished by N.C. Fassett (Rhodora 26: 153-160, 1924) are represented.

(a). Var. *aquatica*— This is the tallest variety, reaching 7 to 8 feet, with large handsome panicles and broad nodding blades. It is localized in part of the South Nation drainage, and in Bear Brook it now lines the muddy bottom and banks from Carlsbad Springs across Russell County to its mouth near Pendleton. The first specimen from Bear Brook (near Bourget, *Senn et al.*), however, is dated 1941. The patches in Cobb Lake, a spring-fed enlargement of another tributary, were first observed in 1952 and, in 1953, were noted to have enlarged considerably. From the South Nation itself we have an old specimen from Casselman dated 1884 which indicates that the variety may possibly have been present in the area originally. On the other hand, the area is isolated from the nearest known stands some 30 miles to the southeast and the chances for natural migration across this gap invites speculation.

Elsewhere along the northern fringe of its range in Canada, the variety occurs similarly as isolated patches, perhaps as relicts from a former more extensive and



continuous range. At present, the plants localized in the southeast of the District produce only a small number of good grains and are often killed by frost before all panicles are mature, which may indicate that conditions are not now the best for growth and propagation. Map 93.

Certain specimens (*Gillett et al.* 1549; *Dore & Moore* 10567, 10576, 10583) collected from Castor River between Russell and Embrun are plants of low stature and with relatively short awns (1.0 to 3.5 cm., in contrast with 2 to 7 cm. in typical plants). They are definitely related to var. *aquatica* and probably come in the same category as the Macoun collection (*No.* 85842) from Casselman cited by Fassett as approaching var. *brevis* Fassett, otherwise present only in the St. Lawrence near Quebec City. Further study of the nature and origin of these plants is needed.

(b). Var. *angustifolia* Hitchc. — This is the most common variety in the District and colonizes the Mississippi and Rideau Rivers in continuous stands in slow-moving water up to 3 feet deep. The Jock River, from Twin Elm (at which point it seems to have been planted) down to its entrance into the Rideau, also supports dense stands. In the Ottawa, this variety is seen only at special points, such as in the head of Shirley Bay where a large stand has developed. No Wild-rice is known in the waters north of the Ottawa so it is thought that it entered the District from the southwest, perhaps by way of the Mississippi. McMorine's collection from 'Mississippi River, Beckwith, Aug. 1862' and Whyte's from Almonte, 1879, are the earliest for the District. The first collections from the Rideau, dated 1894, 1897 and 1898, are all from below Billings Bridge; no plants are known for several miles above. Were the plants in the lower Rideau the descendants of those that migrated down the Mississippi, entered the pre-Ottawa, then passed by way of a former channel (Dows Swamp) to Billings Bridge? Or did the Indians bring the seeds to their camp site at the foot of the Hogs Back rapids? The stands in the upper Rideau, in the Jock and the Carp, as well as some of those in the Mississippi, show an admixture of types which may indicate widespread recent establishment from imported seed. Map 94.

(c). Var. *interior* Fassett — A large stand of this tall variety, characteristic of the north central States, has been present for a number of years in Ottawa River between Orleans and Cumberland; a smaller stand was located in a small stream flowing into the Ottawa at Woodroffe in 1953. They are considered to be introductions. Map 95.

## TRIBE IX. PANICEAE

### 40. *Digitaria* Heister

Annual, generally purplish, grasses with the spreading basal branches prostrate and sometimes rooting at the lower nodes. Inflorescence of 2 to 10 slender spike-like racemes arranged digitately at the end of the culm. Spikelets in pairs, appressed to one side of the winged rachis, one short-pedicelled, the other almost sessile. Lower glume minute or wanting; upper glume one-half to full length of spikelets. Lemma of sterile floret herbaceous, usually pubescent

with minute soft hairs, awnless; lemma of fertile floret, firm, smooth and hairless, its margins membranous, enclosing the palet but not involuted. Blades flat; ligule membranous.

- A. Sheaths and blades (at least the lower) papillose-pilose; lower glume firm, 0.2 mm. or less long; upper glume narrow, about half as long as spikelet; fertile lemma silvery or grayish-brown. .... 1. *D. sanguinalis*
- A. Sheaths and blades hairless, except for cilia on margins; lower glume absent or a minute membranous scale; upper glume equaling the spikelet; fertile lemma dark brown. .... 2. *D. ischaemum*

1. *Digitaria sanguinalis* (L.) Scop. LARGE CRAB-GRASS

A troublesome weed in gardens, germinating late but growing rapidly and producing numerous inflorescences with long spreading finger-like branches by late August. The firmly rooted branches make it a difficult weed to pull up complete.

Although widespread across southern Ontario and Quebec, apparently still confined to gardens in the City, from New Edinburgh to Woodroffe; first specimen collected by Macoun in 1894. Introduced from the Old World where several variants occur; ours is subsp. *vulgaris* (Schrader.) Henrard. Map 96.

2. *Digitaria ischaemum* (Schreb.) Muhl. SMALL CRAB-GRASS

A serious weed especially in lawns, often giving a purplish and rough appearance to the turf in August when the growth of perennial turf grasses is retarded by drought. Apparently more resistant to wear than *D. sanguinalis* and consequently better able to grow along paths, on gravel and dirt roadways, in closely grazed pastures and in heavily trodden lawns. It has also invaded moist beaches of Ottawa River.

More widespread than *D. sanguinalis* and probably present throughout the District. First collected in 1880 in waste places on Wilbrod Street by Whyte. Introduced from Europe. (*D. humifusa*) Map 97.

41. *Panicum* L.

Low or medium-sized grasses lacking rhizomes or stolons, with distinct panicles. Spikelets plano-convex, oval or elliptical in outline. Spikelets 2-floreted but the lower floret sterile and consisting only of a glume-like lemma and a rudimentary membranous palet, the upper floret perfect and producing a grain. Glumes herbaceous, the lower less than half the length of the spikelet, the upper as long as the spikelet. Lemma of sterile floret herbaceous and similar to upper glume. Lemma of fertile floret hard, white, gray or cream-colored, smooth and shiny, enclosing the palet which is of similar texture. Awns absent. Foliage with pilose pubescence at least on the margins of the sheath and lower margin of blade, often papillose-pilose or conspicuously pilose on sheaths and blades. Sheaths open to base. Ligule a row of fine hairs, sometimes fused together at base.



- A. Perennials; basal blades shorter and firmer than the stem blades, forming a winter-green rosette, browning but persisting in mid-summer.
- B. Blades elongate, less than 5 mm. broad and more than 5 cm. long, erect and appearing as basal, the internodes being few and short; forming dense clumps of foliage, with the secondary panicles formed later in the season hidden among them. (Panicle branches finely scabrous all over; ligule hairs 0.5 to 1.0 mm. long.)
- C. Spikelets 3.0 to 3.5 mm. long, the apex sharp due to the second glume and sterile lemma projecting slightly beyond the fruit. (Spikelets and blades essentially hairless.) ..... 1. *P. depauperatum*
- C. Spikelets 2.0 to 2.8 mm. long, the apex blunt; glume and lemma not surpassing fruit. (Spikelets sparsely pubescent; blades and sheaths sometimes conspicuously pilose.) ..... 2. *P. linearifolium*
- B. Blades not elongate, if less than 5 mm. broad then not over 5 cm. long; culms well developed, with spreading cauline blades. (Panicle branches smooth, scabrous or pubescent; ligule 0.3 to 5.0 mm. long; spikelets pubescent.)
- D. Spikelets 1.3 to 2.2 mm. long; blades 0.2 to 0.7 mm. broad; panicle branches smooth, hairless or pubescent, not scabrous.
- E. Ligule hairs less than 0.5 mm. long on upper leaves, generally curved.
- F. Panicle axis and culms hairless; spikelets 2.0 to 2.2 mm. long; plant usually bright green. .... 3. *P. boreale*
- F. Panicle axis and culms densely puberulent; spikelets 1.8 to 1.9 mm. long; plant usually purplish. .... 4. *P. tsugetorum*
- E. Ligule hairs straight, conspicuous above throat of sheath, 1 to 5 (generally 3) mm. long. (Spikelets 1.3 to 2.0 mm. long; panicle axis hairless or pilose; plant green or purple-tinged.) ... 5. *P. lanuginosum*
- D. Spikelets 3.0 to 3.8 mm. long; blades over 10 mm. broad; panicle branches finely and densely scabrous or puberulent. (Ligule usually 0.3 to 0.4 mm. long; blades hairless on surface).
- G. Larger blades 1.3 to 1.8 cm. broad, standing erect; panicle branches erect..... 6. *P. xanthophyllum*
- G. Larger blades 2.5 cm. broad, spreading from stem; panicle branches wide-spreading..... 7. *P. latifolium*
- A. Annuals; basal blades generally smaller but weaker in texture than the stem blades, soon withering and drying.
- H. Spikelets small, 1.5 to 3.5 mm. long; in native habitats or weeds in disturbed land.
- I. Foliage essentially hairless; first glume truncate; culm zig-zag. ....

- ..... 8. *P. dichotomiflorum*
- I. Foliage spreading-pilose, especially on sheaths which are usually papillose also; first glume acute; culm straight (except in *P. tuckermanii*).
- J. Panicle narrower than long; all branches erect or ascending, spreading at an angle of about 30° when mature. .... 9. *P. flexile*
- J. Panicle as broad as long, branches more widely spreading and divaricate.
- K. Panicle one-half height of whole plant; culm brittle below panicle at maturity; spikelets 2.0 to 3.0 mm. long, long-acuminate; glumes persistent; fruit 1.3 to 1.8 mm. long with 5 veins visible in face-view of lemma. .... 10. *P. capillare*
- K. Panicle less than one-half height of whole plant; culm not fracturing easily; spikelets 1.6 to 2.1 mm. long, short-acuminate; glumes falling with spikelet; fruit 1.2 to 1.5 mm. long with 3 veins showing in face-view.
- L. Culm straight; spikelets single at end of branches; fruits 1.4 to 1.5 mm. long, 1.0 mm. broad; plants of thin soil on rocks. .... 11. *P. philadelphicum*
- L. Culm zig-zag; spikelets racemose near ends of flexuous branches; fruits 1.2 to 1.3 mm. long, 0.7 mm. wide; plants of flood-shores. .... 12. *P. tuckermanii*
- H. Spikelets large, 4.5 to 5.0 mm. long; panicle heavy and branches drooping; cultivated or seldom escaping. .... 13. *P. miliaceum*

#### 1. *Panicum depauperatum* Muhl. IMPOVERISHED PANIC-GRASS

A characteristic species of deep sands, distributed across the land to the north and west but in the District known only near the shores of Ottawa, Gatineau and Lièvre Rivers and on the sand plain at Uplands. Collections have been made on nine different occasions at Constance Bay where it is common and at six other widely scattered stations. Map 98.

All our plants are var. *psilophyllum* Fern., having essentially hairless foliage.

#### 2. *Panicum linearifolium* Scribn. NARROW-LEAVED PANIC-GRASS

A characteristic species of deep sand, like *P. depauperatum*, but quite different in its distribution, the majority of the stations being away from river banks; apparently not present at Constance Bay. It also occurs on shallow soil over rock and often in partial shade.

The two varieties (which some authors consider as separate species) are generally easy to distinguish by the degree of their pubescence. They have the same habitat and same distribution in the District, are about equally abundant



(17 and 24 specimens, respectively), and at seven sites have been collected side by side. Map 99.

(a). Var. *linearifolium* — The typical variety, has conspicuously long-pilose sheaths and blades, and usually culms also.

(b). Var. *wernerii* (Scribn.) Fern. — It is essentially hairless except for the ciliate-margined sheaths; sometimes the lowermost sheaths may be sparsely short-pilose. More slender than *P. depauperatum* which it resembles.

### 3. *Panicum boreale* Nash NORTHERN PANIC-GRASS

A common species in the Maritime Provinces but scarce and localized in the District. Map 100. Two varieties are represented:

(a). Var. *boreale* — Hairless blades except for the papillose-based cilia on margin of sheaths and base of the blades. Found along Gatineau River at Chelsea, Kirk's Ferry and Wakefield.

(b). Var. *michiganense* Farw. — Described (Rhodora 42: 306, 1940), as having the blades sparsely long-pilose on the surfaces and the back of the collar densely short-pubescent. Collected in the sandy woods at Constance Bay six times, in the woods along Ottawa River at Wychwood three times, and on "the island at Chelsea" (Macoun in 1911). The latter habitat is no longer in existence, but recently it has been reported from "île Marquerite" (at Farmer Rapids) a little lower on the Gatineau (LeGallo in Nat. Canad. 79: 273, 1952). This variety extends down the Ottawa into southern Quebec but does not grow in the Maritimes. Six specimens of the species preserved in herbaria outside of Ottawa have not been re-examined for variety.

### 4. *Panicum tsugetorum* Nash HEMLOCK-GROVE PANIC-GRASS

In general appearance similar to *P. lanuginosum* var. *fasciculatum* but a long first glume, a short ligule and short pubescence distinguish it.

Known only from the sandy woods, clearings and roadsides at Constance Bay where it has been collected on eleven occasions. A specimen labeled "Ottawa" (Scott in 1890) in University of Toronto herbarium, is assumed to be from the same locality. It occurs on similar shoreline deposits of sand along the upper Ottawa and shores of Great Lakes. Map 101.

Mature spikelets on our specimens fall between 1.8 and 1.9 mm. consequently it seems best to keep the entity separate from *P. columbianum* in which it is sometimes included.

### 5. *Panicum lanuginosum* Ell. HAIRY PANIC-GRASS

This is a polymorphous species made up of several varieties which some authors, following the monograph by Hitchcock and Chase (Contr. U.S. Nat. Herb. 15, 1910), prefer to maintain as distinct species. The characters given for separation under each variety are variable and their limits overlap, but when numerous specimens are examined and their stations mapped, groups showing distinctive habitats and distribution patterns are evident.

Members of the species are likely to be confused only with *P. boreale* and *P. tsugetorum*: *P. boreale* has a much shorter ligule (0.3 mm.), and longer spikelets (2.0 to 2.1 mm.); *P. tsugetorum* has a short ligule (0.7 mm.), a finely and densely pubescent culm, and a longer (0.8 mm.) and sharper first glume. All members of *P. lanuginosum* have a long ligule (2 to 4 mm.), a short (0.4 mm.) blunt first glume, and hairless, pilose or papillose-pilose culms.

(a). Var. *implicatum* (Scribn.) Fern. — Spikelets smaller (1.3 to 1.5 mm. long), usually pale green; axis of panicle pilose; blades uniformly long-pilose; blades uniformly long-pilose above with hairs 2 to 4 mm. long, uniformly appressed pilose below with hairs about 1 mm. long. The plant in general is more dwarf, weaker, with poorly developed winter rosette, more pubescent and the leaves softer and often paler green than the other varieties. It is present in old clearings, in sterile pastures usually on sandy or gravelly soil or sometimes on thin soil over bed rock. It has a general distribution and is not related to river courses. Map 102.

(b). Var. *fasciculatum* (Torr.) Fern. — Spikelets larger (1.6 to 1.7 mm. long), deep maroon when mature; axis of panicle sparsely pilose towards base; blades sparsely pilose with a few long hairs towards base on the upper surface, appressed hispid to appressed short-pilose (hairs 0.5 mm. long) on lower surface especially towards tip. This plant is taller, with elongated stems and well-developed rosettes of purple blades, quite pubescent below on sheaths and culm and generally dull green, deeply tinged with purple. It is generally found on moist sandy land or on soil periodically wet such as that over level strata of rock. Many of the collections have been made along Ottawa River (but back from the beach) or along its former courses represented by the sand deposits at Merivale, Uplands and Mer Bleue. Map 103.

(c). Var. *septentrionale* (Fern.) Fern. — Spikelets slightly larger (1.7 to 1.8 mm. long), generally green; axis of panicle and the upper culm hairless; blades hairless above and usually also beneath but may be appressed hispid-pilose towards tip on the upper ones; plants in general are robust (unless injured by flood waters) with well-developed basal rosette of broad green blades and are quite hairless except for the sheaths near their base. The variety is restricted to flood shores of the Ottawa between Shirley Bay and Kettle Island, the lower Gatineau as far up as Wakefield, and the Rideau just above Billings Bridge. Thirty-three specimens have been collected, eighteen between Ironside and Chelsea. Map 104.

In the U.S. National Herbarium are specimens under *P. lindheimeri* (Nash) Fern. from 'Britannia, Lac des Chênes,' and 'Rideau River, Ottawa.' These have not been re-examined, but could probably be placed in var. *septentrionale* as treated here.

## 6. *Panicum xanthophysum* Gray YELLOW PANIC-GRASS

A distinctive species with broad erect blades and long-exserted narrow panicles bearing relatively few and large spikelets; confined to sandy soils. Six



collections have been made at Constance Bay and four at Wakefield, but eight others are more scattered. The exact location of the first collection (by Fletcher) "sandy dry field, Ottawa, 1878" is not known. Widespread across Quebec and Ontario to Manitoba. Map 105.

#### 7. *Panicum latifolium* L. BROAD-LEAVED PANIC GRASS

Rare in District; formerly known from King Mountain (*Harrington* in 1909; *Rolland* in 1917) and thought to have become extinct, but recently collected at île Marquerite in Gatineau River at Farmer Rapids (*LeGallo* in 1947), at Kingsmere at a level just above the highest Champlain beach (*Dore* in 1953), at Fitzroy Harbour just above flood limit of Ottawa River (*Dore & VanRens* in 1954). The closest other records are Pointe-au-Chêne (40 miles E), Westport (60 miles SW), and opposite Deep River (95 miles NW). In our part of its range it seems to be a plant found in dry woods of oak and pine; at King Mountain, Westport and Deep River the grass occurs on the exposed slopes of the granite, and at Fitzroy Harbour on limestone pavement. (Early specimens labeled *P. Boscii* Poir.) Map 106.

#### 8. *Panicum dichotomiflorum* Michx. FALL PANIC-GRASS

Only recently discovered within the District; along the muddy flood banks of Bear Brook at three places, 1 mile, 3 miles and 7 miles east of Carlsbad Springs (*Dore & Moore* 10528, 10531; *Dore* 14707). The plants are variety *geniculatum* (Wood) Fern., not known elsewhere in Ontario. In parts of the United States it has spread widely as a weed. The occurrences along Bear Brook undoubtedly represent the result of a single introduction, originating perhaps at the site of the once-popular spa from a seed brought in several years ago, but sometime after 1911 otherwise Macoun would have collected it while botanizing there that year. Map 107.

#### 9. *Panicum flexile* (Gatt.) Scribn. WIRY WITCH-GRASS

A rare species, localized in Ottawa Valley between Ottawa and Arnprior as part of a wider distribution mainly along the shores of Great Lakes. Nine specimens only have been collected, between 1879 and 1952, along the upper gravelly or sandy beach of Ottawa River at Britannia, Shirley Bay, Ennis Point, Aylmer and above Hull, and at inland points on limestone barrens near Kinburn and near Almonte. Map 108.

#### 10. *Panicum capillare* L. OLD WITCH-GRASS, COMMON WITCH-GRASS

An abundant and widespread weed of gardens, arable land, roadways and disturbed waste land. The large panicle becomes rounded at maturity at which time its culm fractures readily, releasing it to roll along with the breeze and to scatter its smooth slippery fruits. While now prevalent everywhere on cleared land, it still persists in what is considered to be its original native habitat along the flood shores of rivers, developing on the moist beaches in late summer. There plants are smaller, often considerably reduced and depauperate and not nearly so robust or prolific as those on cultivated lands. Sixty nine specimens have been collected, dating back to the earliest, from "cultivated fields, Wilbroad Street" (Whyte, 1879). All our plants are probably the poorly separated var. *occidentale* Rydb. Map 109.

11. *Panicum philadelphicum* Bernh. PHILADELPHIA WITCH-GRASS

A delicate light-green species with an ovate terminal panicle and several smaller and partially included panicles on the secondary branches which spread out from the base. Found only on the shallow soil accumulated on level limestone which becomes too desiccated in early summer to support plants other than a few late-developing annuals. Only seven specimens of this rare native grass have been collected, all (except Macoun's at Hull in 1911) since 1936. Map 110.

12. *Panicum tuckermanii* Fern. TUCKERMAN WITCH-GRASS

A straggly species generally encountered as dwarfed prostrate plants on soggy flood shores. Under better conditions, such as where beach alluvium has been loosened up, plants develop to a height of 2 or 3 feet with many branching zig-zag stems. A rather rare native, but collected 21 times since Macoun first found it in 1894 "among gravel, Chaudière River, Que.", here considered to be in error for Chaudière Falls. Known along the Ottawa at Morris Island, Shirley Bay and Hull, along Leamy Lake and Leamy Creek, along the Gatineau at Ironside, along Jock River at Twin Elm, and along Castor River above and below Russell. North of Ottawa River it has been collected on the shore of Lac la Blanche, and on "stony cleared area by roadside" (an unusual habitat) at Jarnac a few miles beyond it and just outside the District radius. Map 111.

Often confused with or included in *P. philadelphicum* but in the District quite distinct in its morphology, habitat and distribution.

13. *Panicum miliaceum* L. PANICUM-MILLET, PROSO-MILLET

Sometimes cultivated as a feed grain; occasionally springing up from stray grains around farms (at Twin Elm) or in dumps in the City but not persisting. Collected early by Macoun on Lyon Street in 1894 and again on waste heaps on Gilmour Street in 1896, but then not again until 1932 at Bayswater and Bronson Avenue dumps and 1936 in a vacant lot in the Glebe. In 1952 Groh found it in a trash pile near the Broad Street freight yards. It is a distinctive grass and should have been collected more frequently if abundant. Map 112.

42. *Echinochloa* Beauv.

Annual grasses with coarse spikelets arranged in dense, somewhat one-sided clusters on short panicle branches. Glumes and sterile lemma with coarse trichomes, the sterile lemma often awned. Fertile lemma smooth, shiny and hard, enclosing the palet except at the tip where the palet protrudes. Blades broad, scabrous on margins, hairless; stems somewhat succulent; ligule absent.

- A. Sheaths smooth and hairless; second glume with awn-point less than 1 mm. long; sterile lemma with short or long awn; fertile lemma ovoid.
- B. Tip of fertile lemma wrinkled, dull and distinct from its shiny smooth body, the body hence appearing blunt at the end; a few minute bristles present on the shiny body bordering the tip. .... 1. *E. crusgalli*



- B. Tip of fertile lemma firmer and not demarked by a cross-wrinkle, the lemma body thus appearing acuminate; minute bristles absent. .... 2. *E. pungens*
- A. Sheaths hispid with papillose-based hairs; second glume with awn over 3 mm. long; sterile lemma long-awned; fertile lemma ellipsoid, lacking minute bristles below tip. .... 3. *E. walteri*

1. *Echinochloa crusgalli* (L.) Beauv. BARNYARD-GRASS

A common, coarse and somewhat succulent weed of barnyards, gardens, grain fields and waste places, thriving wherever the soil is damp and rich. A European species reaching the District in the 1880's and now almost everywhere on cleared land and even along open trails into the woods, or among the native species along the Ottawa River shore.

Great variation is shown in the stature, color and density of inflorescence of the plant, but the most variable feature is the length of awns of the spikelets, the awnless or short-awned plants being more abundant than those with awns over 3 cm. long (forma *longiseta* (Trin.) Farw.). Map 113.

2. *Echinochloa pungens* (Poir.) Rydb. SHARP-POINTED BARNYARD-GRASS

Native along the eroding shores of Ottawa River and the connecting lakes and streams; more recently spreading as a weed to dryer open sites adjoining. Three varieties (sometimes considered as distinct species, or sometimes as variants of *E. crusgalli*) are represented in the District:

(a) Var. *pungens* — The typical variety with large spikelets (about 3.5 mm. long and 2.0 mm. broad) with numerous (10 to 25 per side) trichomes and triangular panicle of reflexed-spreading branches is represented by collections from a rocky pasture along Castor River near Russell and the flood shore of Ottawa River near Beechgrove and Eardley, at mouth of Leamy Creek, and above Cumberland, all made within the last few years. Map 114.

(b) Var. *microstachya* (Wieg.) Fern. & Griscom, Rhodora 37: 137, 1935 — This variety bearing smaller spikelets (about 3.0 by 1.5 mm.) with trichomes (15 to 25 per side) of such nature that the spikelets appear 'bristly' to the naked eye, is known from but three points, all along the shore of Ottawa River, at Parliament Hill, Orleans, and above Cumberland. This variety, of southern affinity, is rather common along Lake Erie, Lake Ontario and the St. Lawrence. The local specimens have green to pale maroon spikelets rather than the usual dark purple-brown. (*E. microstachya* (Wieg.) Rydb.) Map 115.

(c) Var. *wiegandii* Fassett, Rhodora 51: 2, 1948 — This variety also has small spikelets (about 3.0 by 1.5 mm.) but with the trichomes sparse (5 to 10 to a side). This is a common Prairie plant and in Eastern Canada, is present mainly along the shores of Great Lakes, St. Lawrence River and the main connecting systems. In the District specimens are mainly from the shores of Ottawa River and its tributaries from the south where it perhaps was originally present and from where it has spread to dry soil in cleared fields and rocky pastures adjoining, as

at Kinburn, Carp, Shirley Bay and Ottawa West. Specimens from Lac Philippe are quite far removed from the mass, but these may be connected through other sites in the upper Gatineau valley [*E. muricata* is reported from Farmer Rapids (Le Gallo, Nat. Canad. 74: 274, 1952)], or represent local introductions from the West in feedstuffs. (*E. occidentalis* (Wieg.) Rydb.) Map 116.

3. *E. walteri* (Pursh) Heller WALTER'S BARNYARD-GRASS

Native in Ontario in marshes along Lake Erie and the land to the south, but recorded in Fletcher's *Flora Ottawaensis* as "along the Nation River, at Casselman". Since no specimen was available, this record was long thought to be erroneous. Plants were discovered, however, in 1952 near Bourget along Cobb Lake which empties into South Nation River about 10 miles below Casselman (Can. Field-Nat. 67: 138, 1953). Most of the plants were pale green in the foliage and panicle, but one individual was purple. The nearest station known is at Sorel, Que. Map 117.

43. *Setaria* Beauv.

Annual weeds or cultivated grasses. Inflorescence a dense spike-like panicle with the bristles (abortive spikelets) which subtend the spikelets numerous and conspicuous. Spikelets themselves awnless, 2 to 3 mm. long. Lower glume one-quarter to one-half and upper glume one-half to full length of spikelet. Fertile lemma hard and brittle, white or pale-colored, involute-margined and clasping a palet of similar texture. Ligule a row of short hairs fused together at the base.

A. Bristles, axis of panicle and culm immediately below panicle scabrous with upwardly pointed barbs.

B. Bristles orange-brown or golden; spikelets about 3 mm. long; fertile lemma coarsely cross-roughened; sheaths keeled, hairless; upper surface of blade with a few long hygroscopic hairs near base. .... 1. *S. glauca*

B. Bristles green or sometimes purplish; spikelets about 2 mm. long; fertile lemma essentially smooth; sheaths not keeled, ciliate with upwardly appressed hairs; blades hairless.

C. Spikelet breaking away from pedicel at maturity leaving a cup-like scar. Common weed. .... 2. *S. viridis*

C. Spikelet breaking up above the sterile lemma, the "fruit" separating out at maturity. Cultivated..... 3. *S. italica*

A. Bristles, axis of panicle and upper culm harshly scabrous with downwardly pointed barbs; clusters of spikelets somewhat spaced, interrupting the panicle especially towards base; upper surface of blade with a few straight hairs near base; sheaths not keeled, appressed ciliate on the margins. .. 4. *S. verticillata*

1. *Setaria glauca* (L.) Beauv. YELLOW BRISTLE-GRASS

A common weed of gardens, fields and waste places throughout the District, present since at least 1879. Known for some years under name of *S. lutescens*



(Weigel) F.T. Hubb. Map 118.

## 2. *Setaria viridis* (L.) Beauv. GREEN BRISTLE-GRASS

A common weed of gardens, cultivated fields, roadsides and waste places throughout the District; known since 1876 and in 1884 Macoun, in one of his few annotations on abundance, stated on a local specimen "naturalized everywhere."

Plants with small panicles, shorter bristles, low-growing and spreading habit, and narrow blades are apparently genetically distinct and belong to variety *weinmannii* (R. & S.) Brand (see: Fernald and Weatherby, *Rhodora* 12: 133-134, 1910). This variation was recognized by early Ottawa botanists and one specimen collected in 1890 by Whyte at the Experimental Farm is annotated "var. *adsurgens* Fletcher", a name which was evidently never published. Macoun also noted on a specimen from railway tracks, Ottawa, 1900, "always lying prostrate, *Setaria* (like) *viridis*". Var. *weinmannii* is almost as common as the taller, fuller-panicked and broader-leaved plant taken as typical of the species, and is often the only one in mowed fields and roadsides and along traveled roadways and railroads, Very small plants which have been called "var. *nana*", may be found in dry pastures, but are merely ecological forms. Map 119.

Green Bristle-grass has not likely developed locally as a weed by "degeneration" of cultivated forms of *S. italica* as often thought.

## 3. *Setaria italica* (L.) Beauv. FOX-TAIL MILLET

German Millet (*S. italica*, subsp. *stramineofructa* F.T. Hubb., var. *hostii* F.T. Hubb., subvar. *metzgeri* (Kornicke) F.T. Hubb.) with its purple awns and yellowish fruits, is sometimes cultivated but has not been known to persist independently in the Ottawa District. Numerous agricultural strains have been developed by breeding and selection.

## 4. *Setaria verticillata* (L.) Beauv. BUR BRISTLE-GRASS

A weed arriving relatively recently, but now a serious nuisance in some parts of the City. First detected by Mr. Groh in a crack in the pavement on Metcalfe Street near Laurier Avenue in 1941 and then in his own garden in Westboro in 1942. Subsequently it was found along the pavement on Seneca Street (*Dore* in 1943), in a garden on Grosvenor Avenue (*Minshall* in 1947), in the Ottawa East dump and in Eastview (*Dore* in 1947). In 1949 it was found to be quite serious in Ottawa South particularly in vicinity of Grosvenor Avenue and in a small garden on Bank Street near Cameron Avenue. In 1950 it was noticed as one of the chief weeds in garden allotments of the Federal District Commission at Rideau Park. The Ottawa infestations are thought not to have originated with plants experimentally cultivated at the Experimental Farm by Fletcher in 1907 and which approach var. *robusta*. In 1953 it was collected in a garden in Pakenham and another specimen was submitted for examination from "a farm near Carleton Place". Map 120.

This annoying grass with its harsh clinging bristles is bound to become one of the serious pests of gardens and waste places throughout the City and vicinity. The form with forwardly barbed bristles has not yet been found in the District.

## TRIBE X. ANDROPOGONEAE

### 44. *Andropogon* L.

Large, tufted perennials with coarse roots and hard, brittle and solid culms. Spikelets arranged in racemes at the end of the culm or at the tips of numerous branches. Spikelets in pairs at each node of the rachis, one fertile and sessile, the other reduced to an awned rudiment borne on a flattened and conspicuously hair-fringed pedicel. Glumes of the fertile floret hard, narrow and awnless. Lemmas thin and membranous, the inner one awned with a twisted and bent awn. Plants essentially hairless, generally glaucous and often purplish. Ligule membranous and fringed with soft hairs.

A. Racemes solitary at the end of the culm and culm-branches. ... 1. *A. scoparius*

A. Racemes 2 to 5 at the end of the culm and culm-branches. .... 2. *A. gerardii*

#### 1. *Andropogon scoparius* Michx. PRAIRIE BEARD-GRASS, LITTLE BLUE-STEM

A grass characteristic of Prairie Grassland, occurring in Ottawa District only along the Ottawa, the Gatineau as far up as Pagan Falls and the lower Rideau on gravelly flood shores or on dry rocks and deep sand deposits bordering the banks. The most extensive stand occurs on the limestone pavement along Ottawa River at Ennis Point, about 10 miles west of the City. Map 121.

According to Fernald and Griscom's treatment (Rhodora 37: 143-145, 1935) two varieties occur within the District:

Var. *septentrionalis* Fern. & Griscom — It has racemes of 5 to 10 fertile florets, usually very flexuous, the rudimentary florets including awn 6.5 to 10.5 mm. long. The type specimen is cited as "Baie Sherley, Riv. Ottawa, Quebec 15 sept. 1925, *Rolland*, 19,199". The site of collection is undoubtedly on the Ontario side of Ottawa River at Shirley Bay, where other collections have been made. This is the variety which is most widespread in Canada and to which all local plants apparently belong. It occurs in two color forms, one purple and one green, to be found growing side by side along the gravel flood-shore of the Gatineau at Farmer Rapids. The green form is scarce or absent elsewhere. Variation in degree of fringing and height of plant is shown in the patch above Billings Bridge on the Rideau.

Var. *neo-mexicanus* (Nash) Hitchc. — This variety has racemes with 11 to 19 fertile spikelets which are scarcely flexuous, and rudimentary spikelets 3 to 4.5 mm. long. A specimen is cited by Fernald and Griscom from the valley of the Gatineau, Ironside, Quebec (*Rolland* 15,291). This particular collection has not been seen but none of the other seven specimens from the same vicinity fit the description. Most authors consider this variety as restricted to the southwestern States. Formerly, these two varieties were included in var. *frequens* Hubbard which, in the strict sense, is confined mainly to the New England States.

#### 2. *Andropogon gerardii* Vitman. BLUE-JOINT TURKEY-FOOT, BIG BLUE-STEM

Much taller and less abundant than the preceding species, present along the



shores of the Ottawa at Pontiac Station, Morris Island, Fitzroy Harbour, Constance Bay, Tremblay Beach, Ennis Point, Shirley Bay and Cunningham Island. Formerly known at Rockcliffe but not collected there since 1911. Above Billings Bridge on the Rideau it was collected as late as 1934, but was absent in 1953. (*A. furcatus* Muhl.; *A. provincialis* Lam., not Retz) Map 122.

#### 45. *Sorghum* Moench

Large and succulent annual with ample and dense panicle. Spikelets in pairs, the lower sessile one fertile, the upper on a slender pedicel, well developed but staminate. Glumes hard and smooth, yellowish, pink or purple, hairy. Lemma very thin and coarsely awned. Foliage hairless.

##### 1. *Sorghum sudanense* (Piper) Stapf SUDAN-GRASS

Sometimes grown as annual forage to be cut as green hay or grazed. Macoun preserved specimens from a roadside in Hull in 1894 and from a waste place along Gladstone Avenue, Ottawa, in 1900 but no others have since been gathered outside of cultivation. It apparently does not persist in our climate.

Economic varieties of *Sorghum* (*S. vulgare*) are not generally grown in the District.

#### 46. *Sorghastrum* Nash

A tall coarse perennial growing in clumps from short thickened rhizomes. Panicles large and contracted, terminating the culms. Spikelets sessile on the short panicle-branches, each paired with a hair-fringed pedicel of a second absent spikelet. Glumes hard and smooth, yellow-brown; the lower inrolled and hairy. Lemmas very thin and transparent; awn bent and twisted, about 1 cm. long. Blades hairless; lowermost sheaths sometimes pilose; top of sheath prolonged into an upright auricle; ligule membranous.

##### 1. *Sorghastrum nutans* (L.) Nash INDIAN-GRASS

A species characteristic of Tall-grass Prairie, present along the sandy or dry rocky shores of the Ottawa and Gatineau Rivers and of the lower Rideau. Since it ranges up the Ottawa to above Mattawa and up the Gatineau beyond Mount Laurier and is not present along river systems from the south, its entrance into the District may have been down from the north and northwest. Abundant at Constance Bay and Farmer Rapids, but scarce elsewhere. The station collected by Macoun in 1897 and Harrington in 1905 at the rapids on the Rideau was thought extinct until the patch was found in 1953 on the north shore between Billings Bridge and Hog's Back. Map 123.

Some plants are quite glaucous in stems and foliage (e.g. *Dore & Breitung* 9301 from Ennis Point; *Dore* 16057 from Chelsea).

### TRIBE XI. TRIPSACEAE

#### 47. *Zea* L.

Tall, stout, cultivated annual grass with pith-filled culm and broad coarse

blades. Spikelets 2-floreted, unisexual; the staminate segregated into a large terminal spreading panicle of racemes known as the tassel, the pistillate densely compacted into a thick succulent spike (the ear) surrounded by the numerous leaves of the husk and situated on a short lateral branch of the culm. Foliage hairless; ligule short, membranous and fringed.

### 1. *Zea mays* L. INDIAN CORN, MAIZE

Extensively cultivated as a fodder plant for ensiling green and as a table vegetable for its grain. Not grown as successfully for feed grain as in warmer parts of Ontario.

Sporadic plants may develop in dumps and around barnyards from viable grain dropped early in the summer, but not persisting from year to year independently. No specimens collected out of cultivation have been preserved.

## DISTRIBUTION MAPS OF SPECIES AND THEIR INTERPRETATION\*

It is generally recognized that all native species (and most introduced species) exhibit a 'pattern' of geographic distribution which corresponds to a pattern exhibited by the factors that influence their spread and persistence. Patterns of distribution, however, only become apparent when botanical surveys have been sufficiently thorough to record reliably most places where a species is present or, equally important, where it is absent. 'False patterns' result when the survey sampling is inadequate or irregular, and this, to a large extent, is still the case with the Ottawa District. Instead of a true pattern, the maps of the distribution of species of grasses give a biased picture because collections have not been made uniformly throughout the District.

To assist in the interpretation of the maps, a composite map has been constructed to indicate the intensity of botanical collection. The composite map is included at the end on transparent paper, so that an overlay comparison can be made. This composite map was made by plotting all the 2,250 grass records on a single 2-mile square grid and summarizing the data by allowing one dot for every five collections. It is obvious from this composite map that a disproportionately large number of collections have been made in the immediate vicinity of the City, particularly around the Experimental Farm and in the area south from it to the Rideau River. With this fact before us, we can be quite sure that certain species, such as *Glyceria melicaria*, *Danthonia compressa*, *Deschampsia flexuosa* and *Bromus tectorum* do not occur, and never have occurred in this part of the District.

On the other hand, there are many square miles of area in the two eastern quadrants of the District where no specimens of grasses have been collected. The southeastern quadrant is largely level rock-free land, extensively farmed, and consequently has had little attraction for the average field botanist. The north-eastern quadrant is rocky and wooded, and undoubtedly still retains most of its native species, but it has not been studied intensively, possibly because it is

\* The symbols used in the plot maps are as follows: a solid symbol indicates the site of collection of a specimen preserved in a herbarium and available for examination prior to 1953. Open symbols indicate sight records by the author, or specimens examined after 1953. A tick on a symbol represents an additional specimen collected at the same site.



relatively remote and inaccessible. Therefore, in either of these eastern quadrants the *absence* of a plot record for any particular species is of little significance, and does not necessarily mean that the species is lacking.

By taking such matters into consideration, some true patterns of distribution become apparent from the records already available. These are of several categories:

(1) *Introduced and well-adapted species* — These have a widely spread pattern, conforming rather closely to the pattern of botanical collection.

Examples: *Poa pratensis*, *Agropyron repens*, *Phleum pratense*, *Echinochloa crusgalli*, *Setaria viridis*.

(2) *Introduced species not well adapted* — If not adapted to conditions in the District, the species are found in a concentrated pattern around the city where their chances of being repeatedly introduced by human activity are greater and where a wide variety of disturbed habitats are available.

Examples: *Festuca rubra*, *Cynosurus cristatus*, *Alopecurus pratensis*, *Anthoxanthum odoratum*, *Phalaris canariensis*, *Panicum miliaceum*.

(3) *Introduced species of recent or sporadic arrival* — They exhibit a pattern concentrated at the site of introduction, spreading outwards.

Examples: *Bromus tectorum*, *Poa chaixii*, *Glyceria maxima*, *Digitaria sanguinalis*, *Setaria verticillata*.

(4) *Native species of widespread distribution* — These occur in (a) well-drained and (b) ill-drained habitats and present uniform pattern (corresponding to the intensity of collecting).

Examples: (a) well-drained habitats: *Bromus ciliatus*, *Schizachne purpurascens*, *Danthonia spicata*, *Agrostis scabra*, *Oryzopsis asperifolia*, *Panicum lanuginosum*; (b) ill-drained habitats: *Glyceria grandis*, *Poa palustris*, *Calamagrostis canadensis*, *Leersia oryzoides*.

(5) *Native species migrating from the south during the Xerothermic Period* — These species show a pattern following the shores of Ottawa River and only the lower portions of the Gatineau and Rideau tributaries. Migration appears to have been overland from the southwest via the 'Thousand Islands Bridge' over thin-soiled rock or along the Mississippi or other tributaries from the same direction into the Ottawa. Spread into the lowlands was prevented by the Ottawa Sea. Examples: *Bromus kalmii*, *Poa saltuensis*, *Agropyron trachycaulum*, *Hystrix patula*, *Sporobolus heterolepis*, *Oryzopsis racemosa*, *Panicum latifolium*, *Panicum flexile*, *Andropogon gerardii*, *Andropogon scoparius*, *Sorghastrum nutans*.

(6) *Native species migrating from the north* — Subsequent to the 'Boreal Pincers' migration across the region north of the District (a) from the east and (b) from the west, some species moved southward down the Gatineau, southeastward down the Ottawa, or overland across the Laurentian Shield.

Examples: (a) *Glyceria melicaria*, *Torreyochloa pallida*, *Trisetum spicatum*, *Trisetum melicoides*, *Danthonia compressa*, *Cinna latifolia*, *Muhlenbergia uniflora*,

*Panicum boreale*. (b) *Phragmites communis*, *Elymus canadensis*. *Agrostis perennans*, *Spartina pectinata*, *Hierochloë odorata*.

(7) *Native species related to late stages of the Ottawa Sea and its estuarian shores* — These have present-day patterns restricted to the valley below Ottawa. Examples: *Bromus purgans*, *Eragrostis hypnoides*, *Elymus wiegandii*, *Cinna arundinacea*, *Muhlenbergia frondosa*, *Leersia oryzoides*, *Echinochloa pungens*, *Echinochloa walteri*.

## POSTGLACIAL HISTORY OF THE OTTAWA DISTRICT

It is known that the whole of the District was covered by a great thickness of ice during the Wisconsin Glaciation and that this ice persisted until some time later than 10,000 years ago. It is also known that, subsequently, most parts of the District were flooded by various bodies of water both saline and fresh. The reason for flooding was the depressed level of the land or local blockage of drainage channels by temporary obstructions.

The sequence of these events, the limits of their physiographic effects, their dates and duration have been given increasing attention by geologists and pedologists. As yet no comprehensive treatment has been prepared to correlate the numerous findings and to summarize the evidence in a form helpful to phytogeographers. Such events had great influence in determining when plants entered the District, from what direction and where they happen to be found at present.

The distribution patterns exhibited by the grasses provide only a few examples out of the many that might be provided by native species of the complete flora. Certain inferences already made to explain the pattern shown by the grass species in terms of postglacial events are based on assumptions such as the following.

- . The total present flora postdates the withdrawal of the Wisconsin Ice Sheet.
- . Colonization of the area was by species that survived glaciation in the region south of the terminal moraine.
- . These species entered the District from various directions depending on the direction and continuity of the routes open for their migration. The shores of the postglacial seas and lakes, for example, provided continuous habitats for the migration of strand species.
- . As seas and lakes expanded, all land plants were eliminated, as were any strand plants which could not keep up with the advancing shore lines.
- . As seas and lakes receded, broad and excellent avenues for rapid migration of almost any type of plant were provided.
- . As the forest cover on this new land thickened up, many low-growing plants were shaded out. Survival of these forms was favored by certain extreme land forms created by the retreating waters, such as wave-washed pavements and cliffs, deep sand deposits, springy slopes, undrained depressions, and en-



trenching drainage courses. In this way certain low-growing, heliophylous species found refugia where they could persist free from the competition of the forest.

- . A few shade-tolerant species invaded the developing forest and moved with it.
- . During the period up until about 3,000 years ago, the climate was much warmer and probably drier than at present. Certain species invaded at this time, to be rendered 'sedentary' by later climatic conditions.

As a basis for further comparisons of the relationship between postglacial events and plant distribution in the District, a tentative map showing the approximate limits of the Champlain and Ottawa Seas is provided (Figure 2). The unshaded areas include the high land in the Laurentian Shield above about 700 feet elevation which is thought to have escaped postglacial flooding. All of the shaded areas were covered by the Champlain Sea. The hatched area was later covered by the Ottawa Sea with its maximum limit plotted at about the 400-foot contour. A later stage is indicated by crosshatching to represent the position of estuaries along the shore of a waning (Ottawa?) Sea. These limits are plotted at 250 feet elevation, those of some large former channels of the Ottawa River west of the City at 300 feet elevation.



**Figure 2. Map of Ottawa District showing approximate limits of areas inundated by postglacial seas.**



# APPENDIX I

## CHRONOLOGICAL TABLE OF COLLECTORS

Year	Collector and number of specimens	Specimens	Species	First Records
1862	McMoline 1 .....	1	1	1
63	McMoline 1 .....	1	1	1
1876	Whyte 2 .....	2	2	2
77	Fletcher 1 .....	1	1	1
78	Fletcher 4, Whyte 1 .....	5	5	5
79	Fletcher 10, Whyte 14, anon. 2 .....	26	22	20
1880	Fletcher 10, Whyte 4 .....	14	13	7
81	Fletcher 1 .....	1	1	1
82	Whyte 1, anon. 2 .....	3	3	2
83	Fletcher 4 .....	4	2	0
84	Macoun 12, anon. 1 .....	13	10	2
86	Macoun 3 .....	3	3	3
87	Whyte 1 .....	1	1	0
88	Macoun 1 .....	1	1	1
89	Macoun 1 .....	1	1	0
1890	Scott 12 .....	12	12	5
91	Scott 10, Whyte 7 .....	17	15	4
92	Fletcher 2, Scott 5 .....	7	6	2
93	Fletcher 1, Macoun 3, Scott 1 .....	5	5	1
94	Macoun 25, anon. 1 .....	26	24	10
96	Macoun 6, Ross 1 .....	7	7	0
97	Macoun 14 .....	14	14	1
98	Fowler 2, Macoun 8 .....	10	10	3
99	Fletcher 1, Fowler 1, Macoun 1 .....	3	3	0
1900	Macoun 4 .....	4	4	1
01	Fletcher 1 .....	1	1	1
02	Fletcher 2, Macoun 7 .....	9	8	0
03	Fletcher 3, Macoun 61, Richard 1 .....	65	50	8
04	Fletcher 4 .....	4	4	0
05	Fletcher 4, Harrington 12, Hayes 1, Macoun 1.	18	17	2
06	Harrington 15 .....	15	14	1
07	Fletcher 1, Harrington 6 .....	7	6	0
08	Fletcher 1, Harrington 6, Macoun 1 .....	8	6	0
09	Groh 10, Harrington 1 .....	11	10	1
1910	Groh 5 .....	5	5	0
11	Güssow 1, Macoun 111, Malte 2 .....	114	66	2
12	Malte 1 .....	1	1	0
13	Macoun 2, Malte 3 .....	5	5	0
14	Adams 2 .....	2	2	0
15	Fyles 1, Rolland 3 .....	4	4	0
16	Hewitt 1, Inglis 1, Rolland 2 .....	4	2	0
17	Malte 1, Rolland 8 .....	9	7	0
18	Inglis 2, Rolland 2 .....	4	3	0
19	Adams 7, Rolland 4, Victorin 1 .....	12	10	0
1920	Inglis 1, Victorin 1, anon. 1 .....	3	3	0

21	Rolland 6, anon. 1 .....	7	6	0
22	Groh 1, Malte 59, Victorin 1 .....	61	37	3
23	Groh 6, Malte 21 .....	27	22	3
24	Groh 2, Rolland 2 .....	4	3	0
26	Groh 3 .....	3	3	1
1927	Groh 2 .....	2	2	0
28	Groh 2 .....	2	2	0
1930	Adams 1, Conners 1, Groh 7, Porsild 2 .....	11	10	0
31	Adams 4, Dore 5, Groh 1, Victorin 2 .....	12	12	0
32	Anderson 1, Dore 45, Minshall 3 .....	49	32	2
33	Dore 2, Groh 1, Minshall 19 .....	22	19	0
34	Cleonique 5, Minshall 25 .....	30	24	1
35	Anderson 1, Cleonique 1, Dore 9, Minshall 13, Rolland 1, Victorin 3 .....	28	23	3
36	Anderson 1, Dore 30, Groh 4, Minshall 3, Dore 5, Groh 3, Minshall 1 .....	9	8	1
38	Adams 1, Cairns 1, Cameron 1, Dore 12, Groh. 11, Minshall 12, Porsild 1, Senn 44 .....	83	40	1
39	Gillett 3, Minshall 62, Porsild 1, Senn 12 .....	78	26	0
1940	Anderson 1, Dore 3, Gillett 2, Groh 3, Jolicoe- ur 1, Minshall 1, Senn 15, Zinck 2 .....	28	19	1
41	Anderson 2, Erskine 1, Groh 30, Minshall 28, Senn 145, Wright 1, Zinck 4 .....	211	49	2
42	Anderson 4, Conners 1, Groh 11, Hart 1, Senn 3	20	17	0
43	Dore 34, Gillett 1, Groh 1, Lamarre 1, Minshall 23, Zinck 4 .....	64	40	1
44	Dore 4, Gillett 1, Groh 2, Minshall 2, Senn 2, Zinck 5 .....	16	13	1
45	Frankton 1, Gillett 2, Groh 5, Lamarre 1, Min- shall 11, Senn 2, Soper 2 .....	24	20	0
46	Anderson, A.W. 1, Calder 19, Gillett 1, Groh 5, Senn 1, Soper 16, Tennant 1 .....	44	34	1
47	Breitung 17, Calder 45, Cody 11, Dore 94, Frankton 1, Gillett 17, Groh 6, LeGallo 2, Minshall 2 .....	194	65	2
48	Bassett 6, Breitung 46, Calder 6, Cody 5, Dore 94, Frankton 3, Groh 6, Lloyd 1 .....	167	63	0
49	Dore 44, Frankton 5, Groh 6, Lindsay 3, Nowo- sad 1 .....	59	29	1
1950	Bassett 1, Calder 6, Dore 43, Frankton 1, Groh 3, Monette 1, Mulligan 1 .....	56	25	0
51	Calder 2, Cody 1, Dore 39, Frankton 2, Groh 3, Monette 1, Mulligan 1, Ouren 7 .....	56	33	2
52	Bassett 1, Bragg 1, Calder 3, Cody 2, Dore 75, Gillett 3, Groh 1, LeGallo 1 .....	87	35	2
53	Anderson, A.W. 6, Bowden 1, Dore 168, Frank- ton 4, Broh 12, Gutteridge 1, Jenkins 81, Lind- say 1 .....	275	77	0

TOTAL SPECIMENS

2,250



## APPENDIX II

### CHECK LIST OF SPECIES

Species	Date of first collection	Number of specimens (up to 1953)	Map Number	Page
<u>TRIBE I    FESTUCEAE</u>				
1. Bromus				
ciliatus	1903	23	2	14
inermis *	1906	16	1	13
japonicus *	1935	3	6	15
kalmii	1880	8	3	14
purgans	1922	3	4	14
secalinus *	1879	4	5	15
tectorum *	1946	4	7	15
2. Festuca				
arundinacea *	1940	3	9	17
capillata *	1944	5	13	18
elatior *	1888	13	8	17
obtusa	1878	14	10	17
ovina *	1898	19	12	17
rubra *	1926	8	11	17
3. Glyceria				
borealis	1880	18	14	19
canadensis	1878	25	16	19
grandis	1879	35	18	20
maxima *	1952	7	19	20
melicaria	1892	8	13	19
striata	1879	38	17	20
4. Torreyochloa				
fernaldii	1879	9	20	21
5. Poa				
alsodes	1892	15	26	24
annua *	1894	11	29	25
chaixii *	1951	1	28	25
compressa *	1890	39	22	24
glauca (?)	1947	1	24	24
nemoralis *	1935	11	23	24
palustris	1886	32	25	24
pratensis *	1886	40	21	23
saltuensis	1898	18	27	25
trivialis *	1936	2	28	25
6. Eragrostis				
frankii *	1947	2	34	27

hypnoides	1891	8	30	26
megastachya *	1900	8	31	26
pectinacea *	1922	10	33	27
poaeoides *	1936	11	32	26
7. Molinia				
caerulea *	1951	1	35	27
8. Dactylis				
glomerata *	1898	16	36	27
9. Cynosurus				
cristatus *	1941	5	37	28
10. Phragmites				
communis	1863	17	38	28
11. Schizachne				
purpurascens	1879	37	39	29

## TRIBE II HORDEAE

12. Agropyron				
cristatiforme *	1936	3	43	30
repens *	1894	34	40	29
smithii *	1923	2	41	30
trachycaulum	1894	28	42	30
13. Triticum				
aestivum *	1932	1		31
14. Secale				
cereale *	1903	3		31
15. Elymus				
canadensis	1882	9	45	33
villosus	1991	1		32
virginicus	1879	55	44	32
wiegandii	1932	3	46	33
16. Hystrix				
patula	1879	30	47,48	34
17. Hordeum				
jubatum	1879	17	49	35
vulgare *	1936	2		34
18. Lolium				
multiflorum *	1936	2	51	36
perenne *	1936	2	50	35

## TRIBE III AVENEAE

19. Sphenopholis				
intermedia	1886	17	52	36
20. Trisetum				
melicoides	1903	1	54	37
spicatum	1903	5	53	37
21. Deschampsia				
caespitosa	1880	10	55	37
flexuosa	1938	3	56	38



22. Avena				
<i>fatua</i> *	1903	3	57	38
<i>sativa</i> *	—	0		38
23. Danthonia				
<i>compressa</i>	1903	6	59	39
<i>spicata</i>	1880	40	58	39

#### TRIBE IV AGROSTIDEAE

24. Calamagrostis				
<i>canadensis</i>	1881	26	60	40
<i>neglecta</i>	1905	1	61	40
25. Agrostis				
<i>gigantea</i> *	1894	39	62	41
<i>canina</i> *	1923	1	67	43
<i>palustris</i> *	1905	38	63	41
<i>perennans</i>	1879	45	66	42
<i>scabra</i>	1891	14	65	42
<i>tenuis</i> *	1923	5	64	42
26. Cinna				
<i>arundinacea</i>	1884	6	68	43
<i>latifolia</i>	1890	19	69	43
27. Alopecurus				
<i>aequalis</i>	1879	20	70	44
<i>pratensis</i> *	1937	8	71	44
28. Phleum				
<i>pratense</i> *	1876	36	72	44
29. Muhlenbergia				
<i>frondosa</i>	1922	10	73	46
<i>glomerata</i>	1881	15	76	46
<i>mexicana</i>	1887	65	74,75	46
<i>uniflora</i>	1943	1	77	47
30. Sporobolus				
<i>heterolepis</i>	1877	3	80	48
<i>neglectus</i>	1879	34	78	47
<i>vaginiflorus</i>	1935	14	79	47
31. Brachyelytrum				
<i>erectum</i>	1894	22	81	49
32. Milium				
<i>effusum</i>	1901	13	82	49
33. Oryzopsis				
<i>asperifolia</i>	1879	41	83	50
<i>pungens</i>	1890	12	85	50
<i>racemosa</i>	1880	30	84	50

#### TRIBE V CHLORIDEAE

34. Spartina				
<i>pectinata</i>	1879	43	86	51

# TRIBE VI PHALARIDEAE

35. Hierochloë				
odorata	1897	15	87	51
36. Anthoxanthum				
odoratum *	1911	5	88	52
37. Phalaris				
arundinacea *	1879	32	90	53
canariensis *	1879	10	89	53

# TRIBE VII ORYZEAE

38. Leersia				
oryzoides	1879	49	91	53
virginica	1878	21	92	54
39. Zizania				
aquatica	1862	72	93,94,95	55

# TRIBE IX PANICEAE

40. Digitaria				
ischaemum *	1880	31	97	57
sanguinalis *	1894	10	96	57
41. Panicum				
boreale	1890	20	100	60
capillare	1879	69	109	62
depauperatum	1934	15	98	59
dichotomiflorum *	1949	3	107	62
flexile	1879	9	108	62
lanuginosum	1880	102	102,103,104	60
latifolium	1909	4	106	62
linearifolium	1893	41	99	59
miliaceum *	1891	8	112	63
philadelphicum	1911	7	110	63
tsugetorum	1890	11	101	60
tuckermanii	1894	21	111	63
xanthophysum	1878	18	105	61
42. Echinochloa				
crusgalli *	1884	60	113	64
pungens	1879	43	114,115,116	64
walteri	1952	3	117	65
43. Setaria				
glauca *	1879	47	118	65
italica *	--	0		66
verticillata *	1941	13	120	66
viridis *	1876	51	119	66

# TRIBE X ANDROPOGONEAE

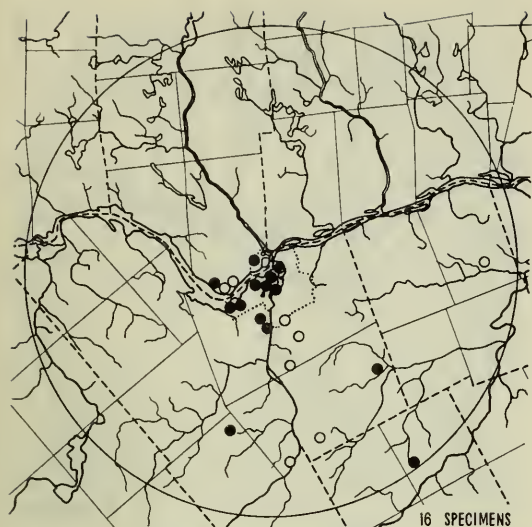
44. Andropogon				
gerardii	1894	17	122	67



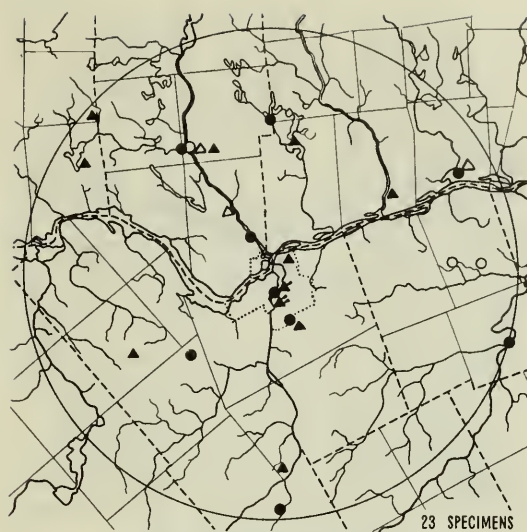
scoparius	1894	27	121	67
45. Sorghum				
sudanense *	1894	2		68
46. Sorghastrum				
nutans	1882	29	123	68
<u>TRIBE XI TRIPSACEAE</u>				
47. Zea				
mays *		0		69

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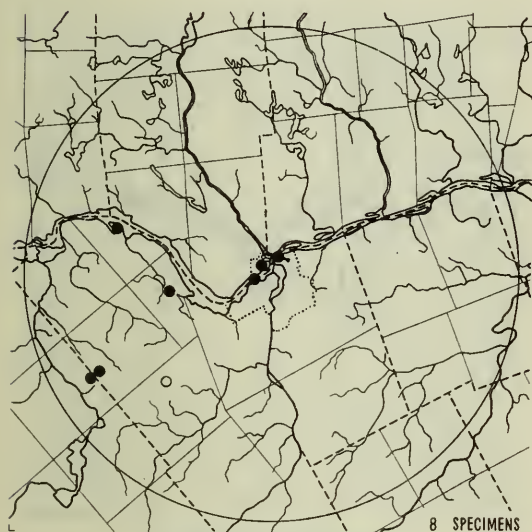
TOTAL = 124 species (71 native, 53 introduced \*) = 2,250 specimens



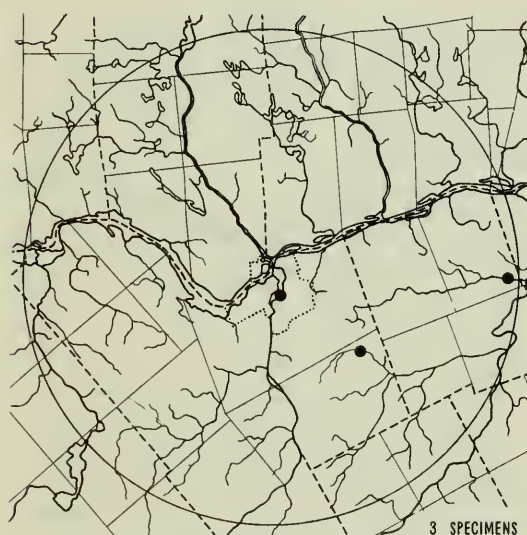
1. *Bromus inermis*



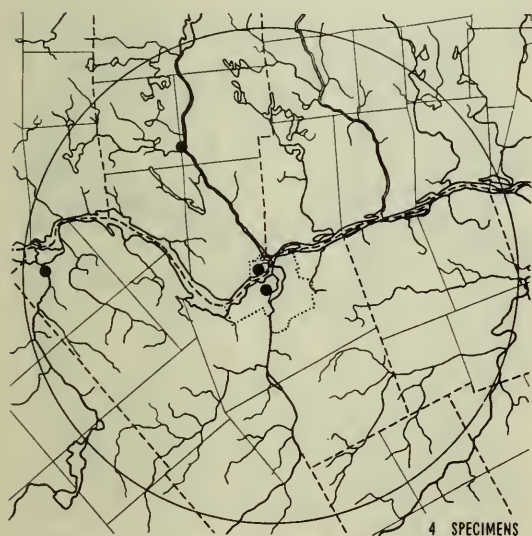
2. *Bromus ciliatus* • var. *ciliatus*  
▲ var. *intonsus*



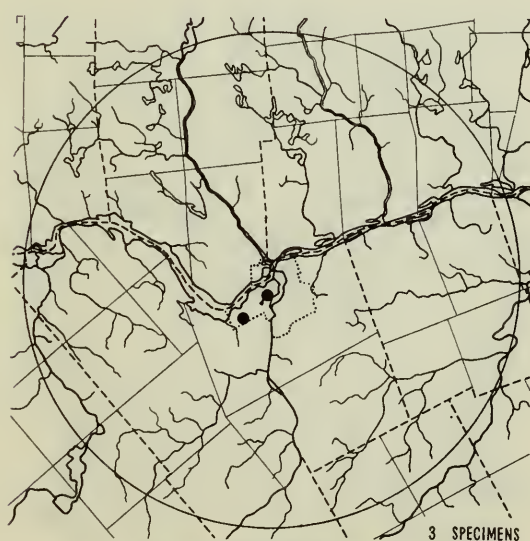
3. *Bromus kalmii*



4. *Bromus purgans*



5. *Bromus secalinus*

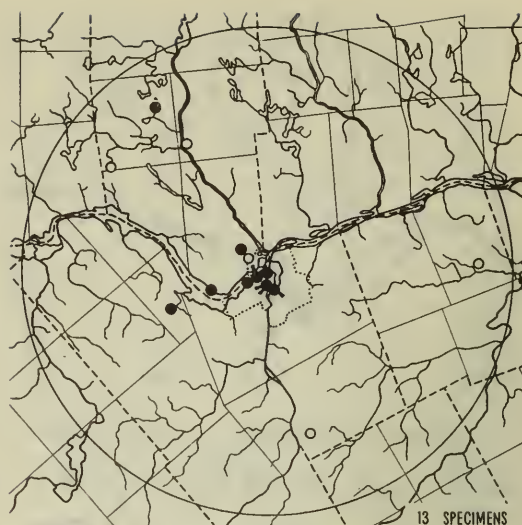


6. *Bromus japonicus*

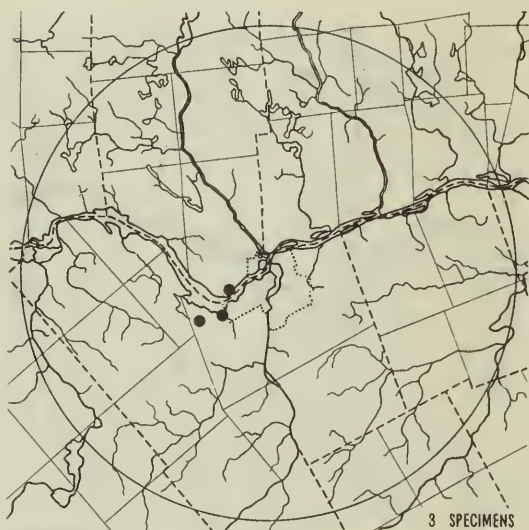




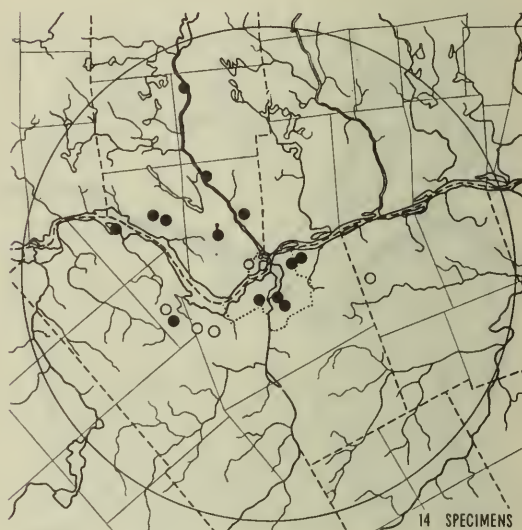
7. *Bromus tectorum*



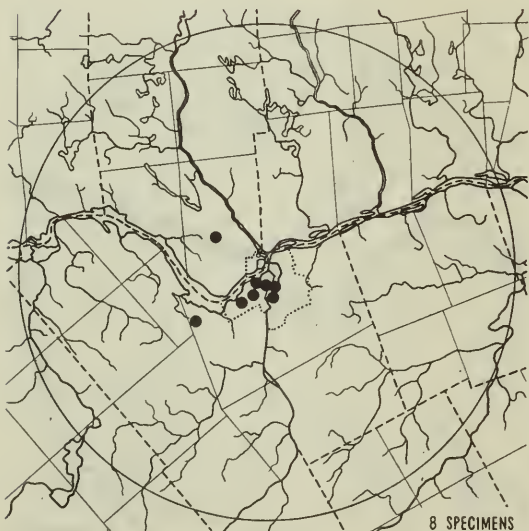
8. *Festuca elatior*



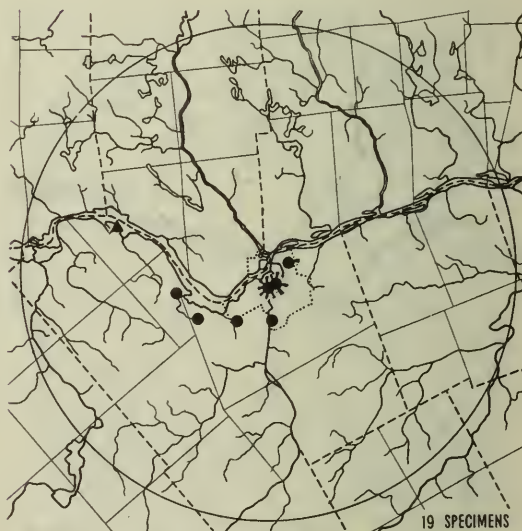
9. *Festuca arundinacea*



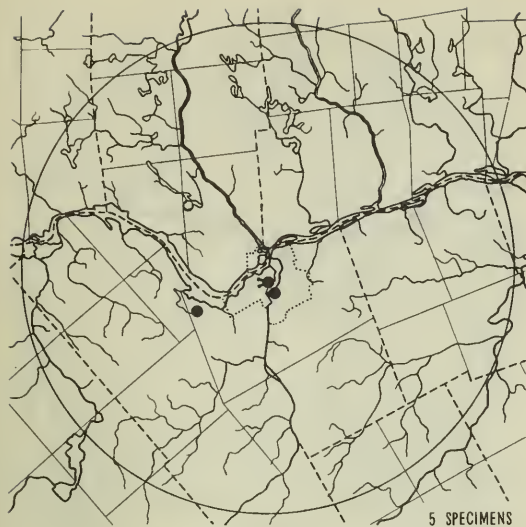
10. *Festuca obtusa*



11. *Festuca rubra*



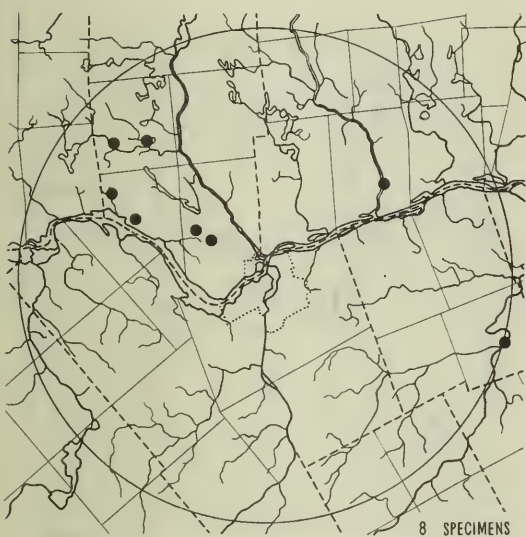
12. *Festuca ovina* • var. *duriuscula*  
▲ f. *hispidula*



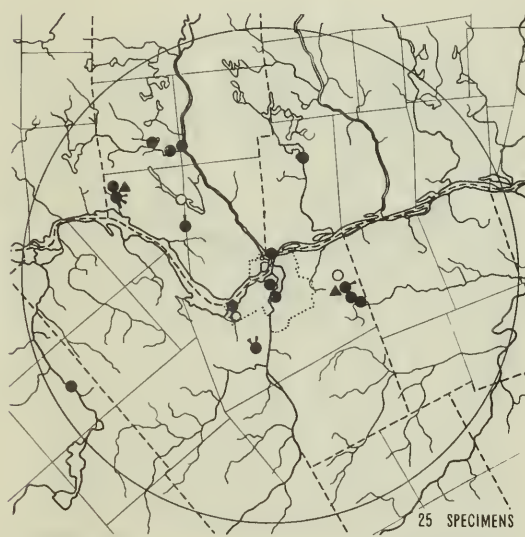
13. *Festuca capillata*



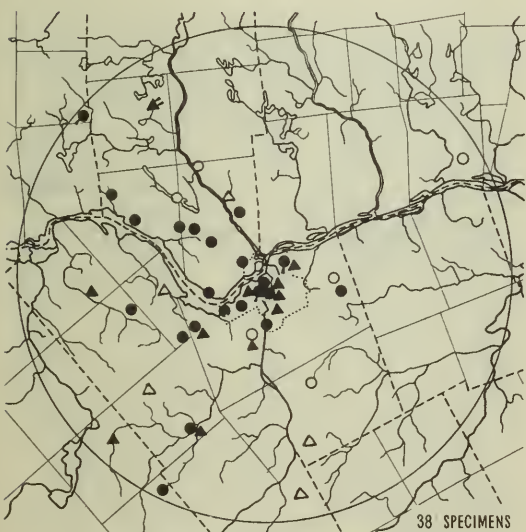
14. *Glyceria borealis*



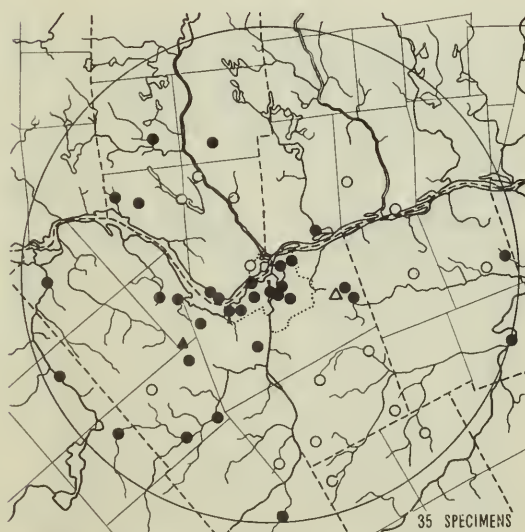
15. *Glyceria melicaria*



16. *Glyceria canadensis* • var. *canadensis*  
▲ var. *laxa*

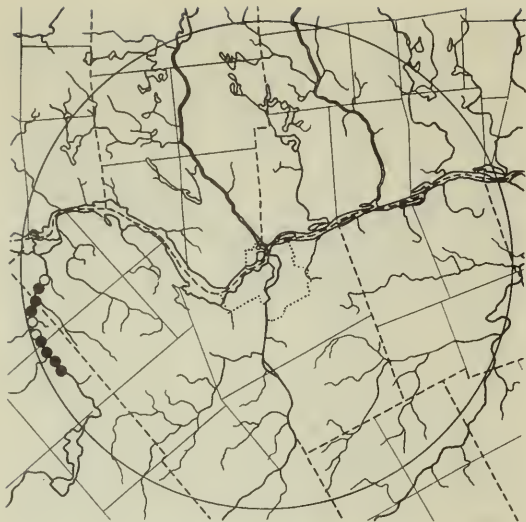


17. *Glyceria striata* • var. *striata*  
▲ var. *stricta*

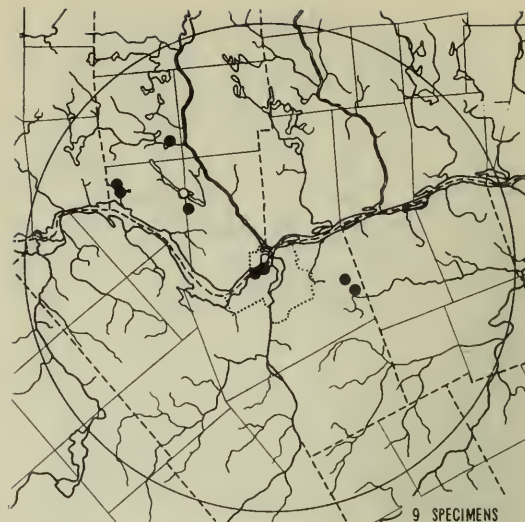


18. *Glyceria grandis* • f. *grandis*  
▲ f. *pallescent*



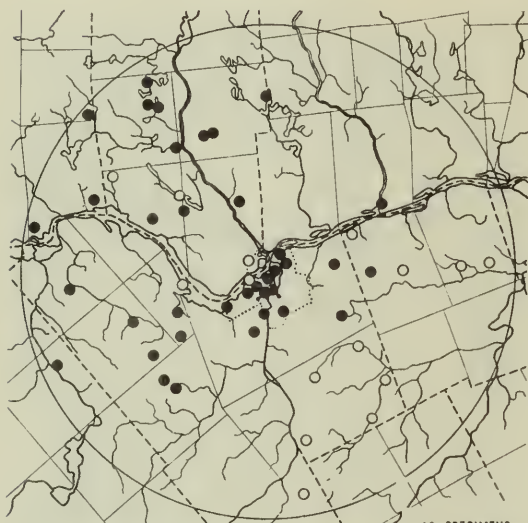


19. *Glyceria maxima*



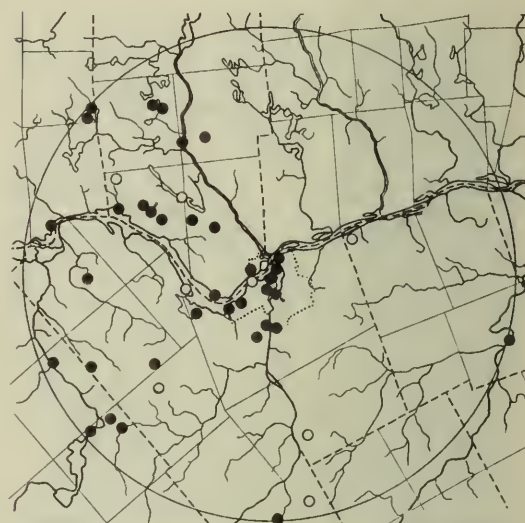
20. *Torreyochloa fernaldii*

9 SPECIMENS



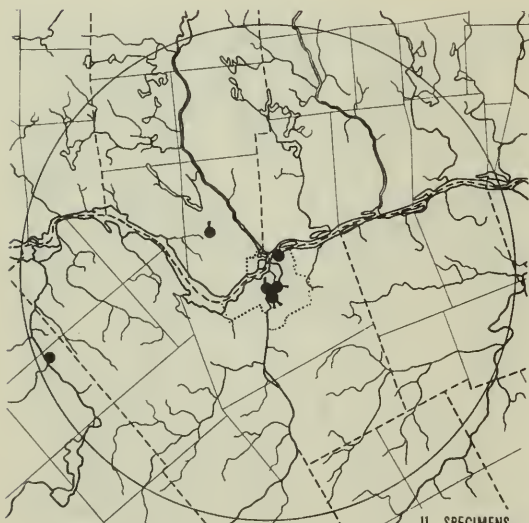
21. *Poa pratensis*

40 SPECIMENS



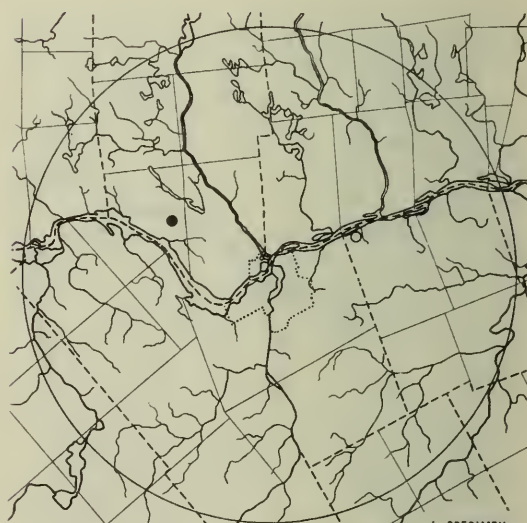
22. *Poa compressa*

39 SPECIMENS



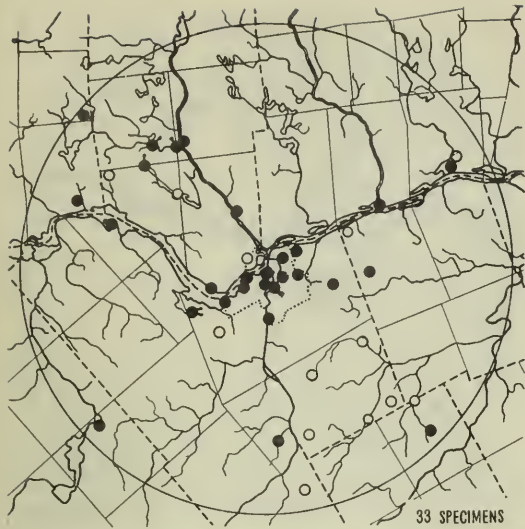
23. *Poa nemoralis*

11 SPECIMENS

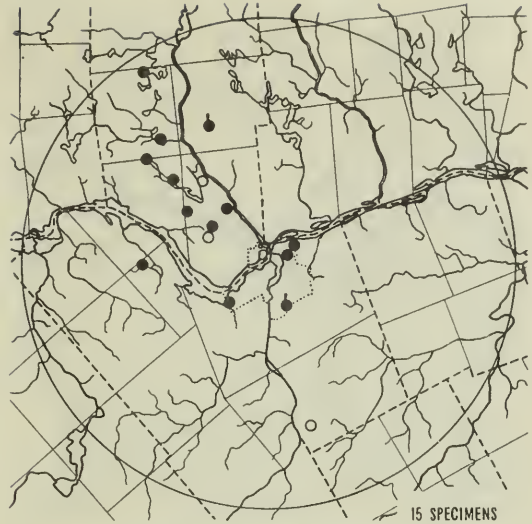


24. *Poa ?glauca*

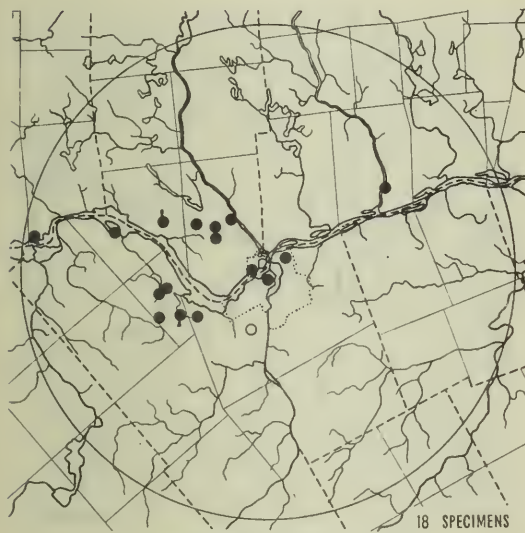
1 SPECIMEN



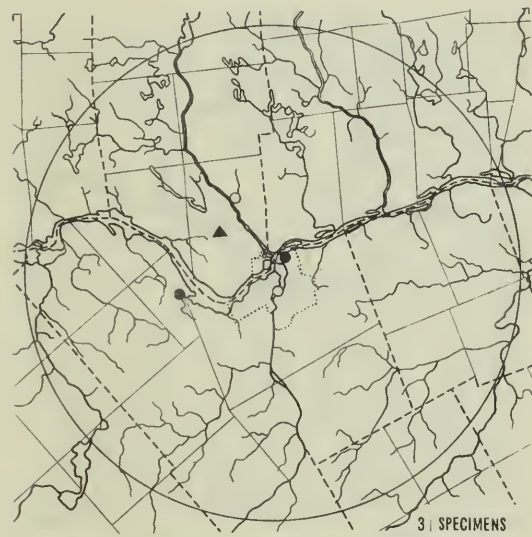
25. *Poa palustris*



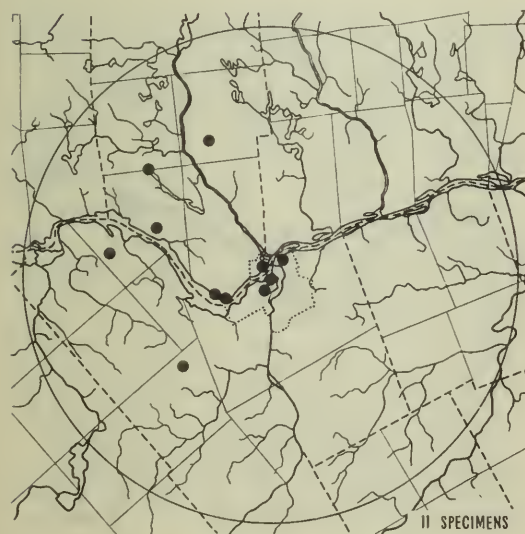
26. *Poa alsodes*



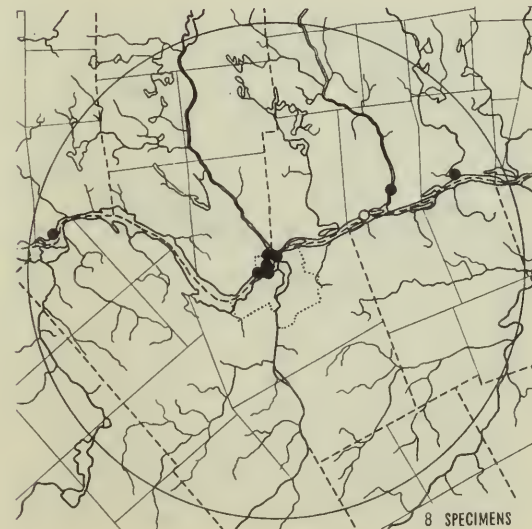
27. *Poa saltuensis*



28. • *Poa trivialis* ▲ *Poa chaixii*

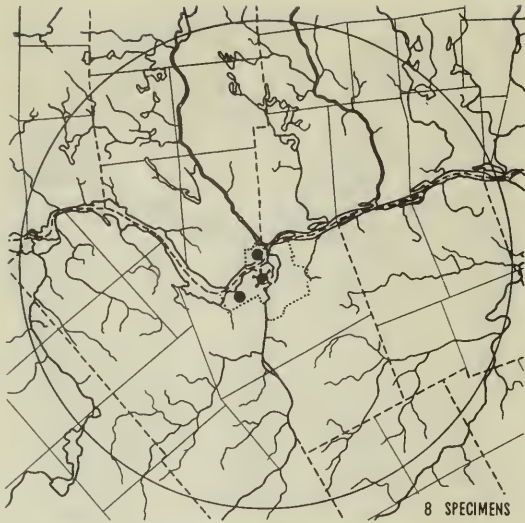


29. *Poa annua*

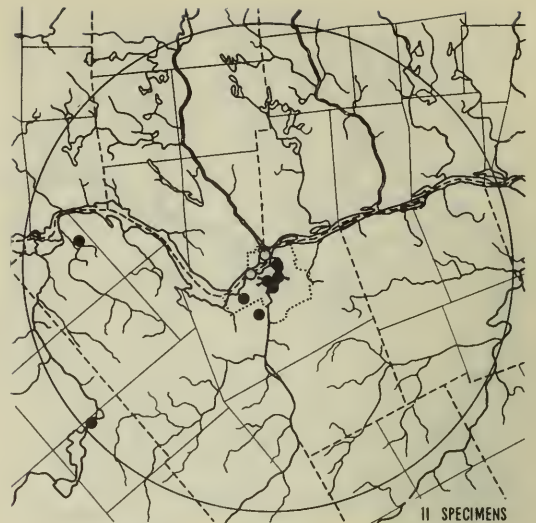


30. *Eragrostis hypnoides*

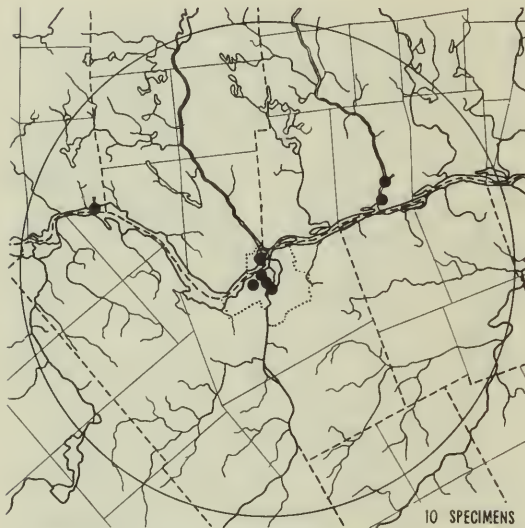




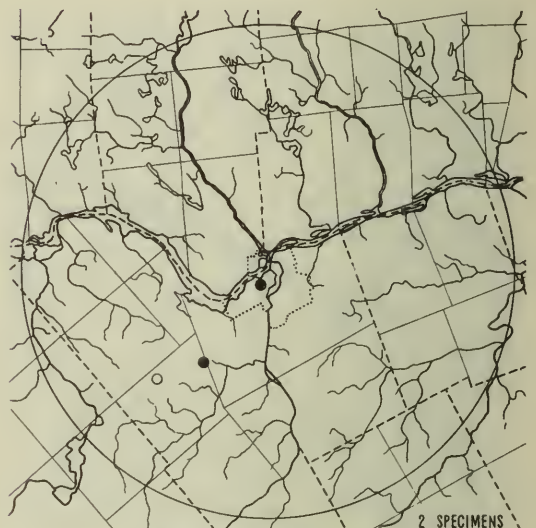
31. *Eragrostis megastachya*



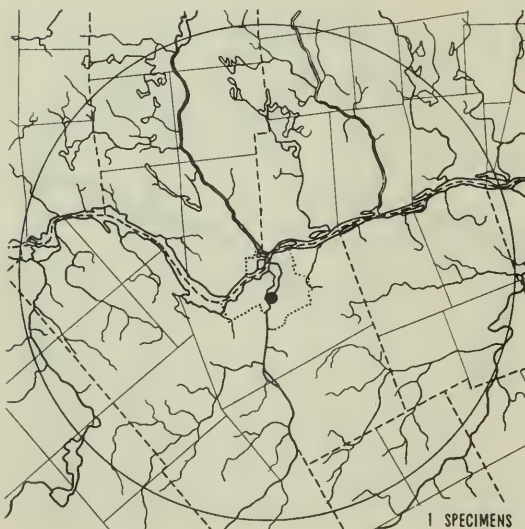
32. *Eragrostis poaeoides*



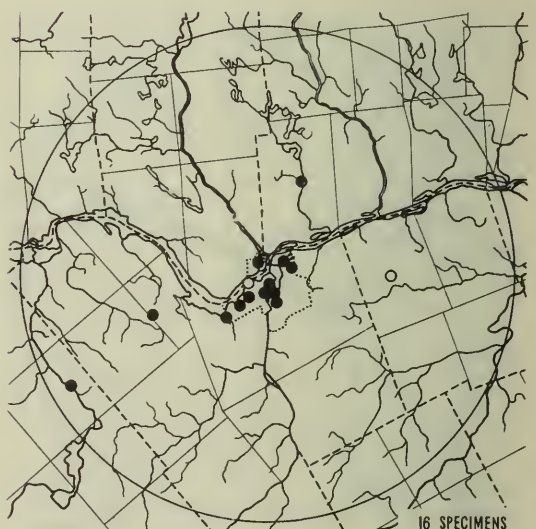
33. *Eragrostis pectinacea*



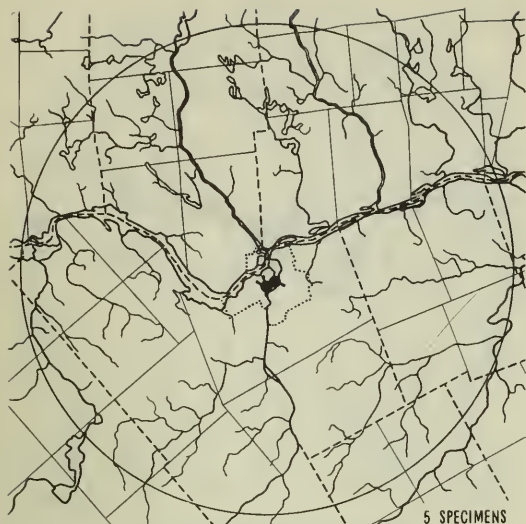
34. *Eragrostis frankii*



35. *Molinia caerulea*

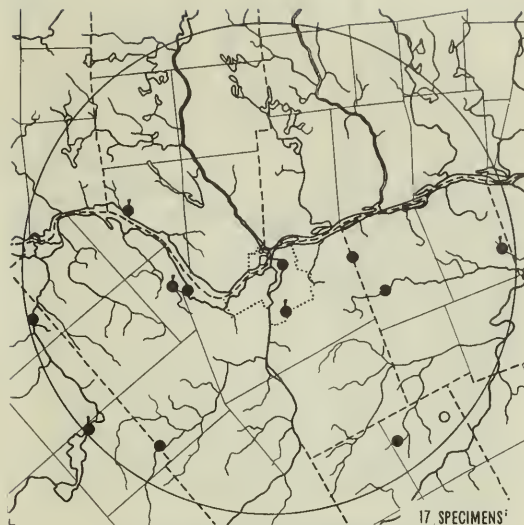


36. *Dactylis glomerata*



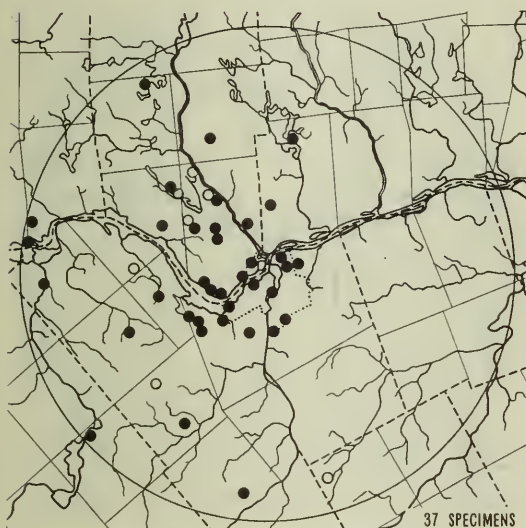
37. *Cynosurus cristatus*

5 SPECIMENS



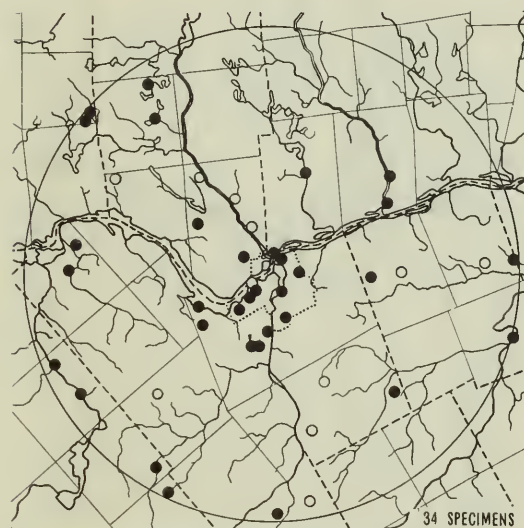
38. *Phragmites communis*

17 SPECIMENS



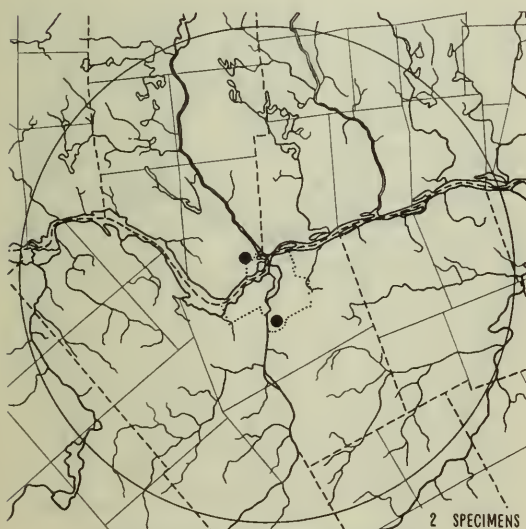
39. *Schizachne purpurascens*

37 SPECIMENS



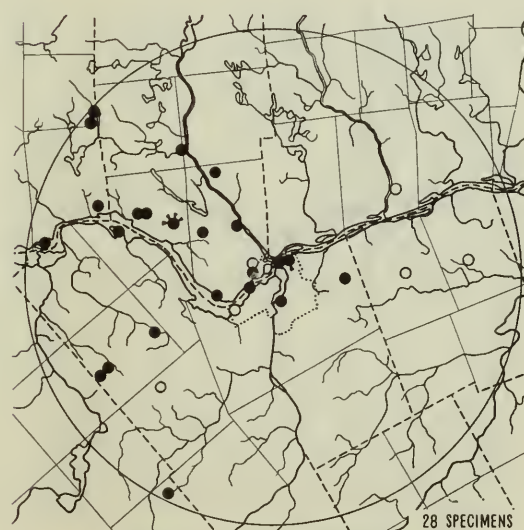
40. *Agropyron repens*

34 SPECIMENS



41. *Agropyron smithii*

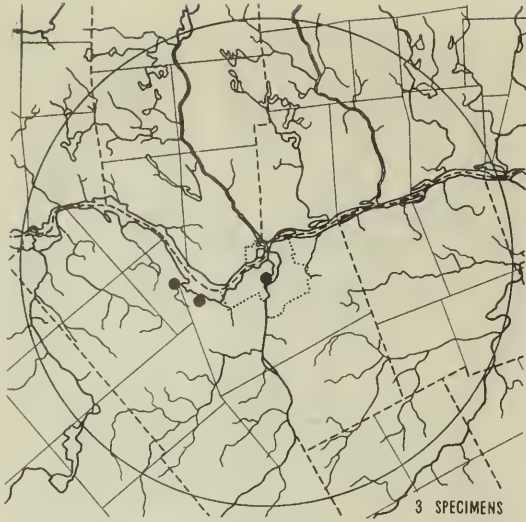
2 SPECIMENS



42. *Agropyron trachycaulum*

28 SPECIMENS

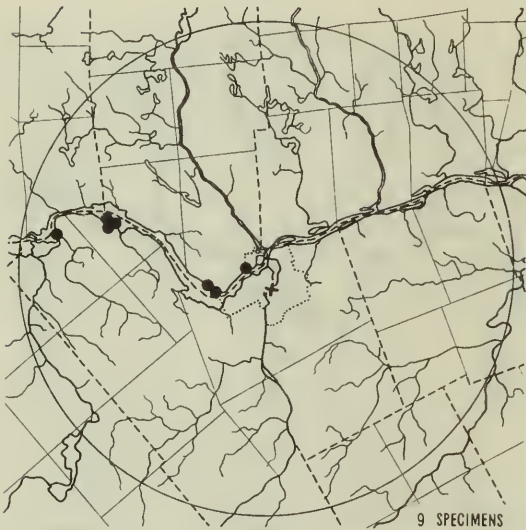




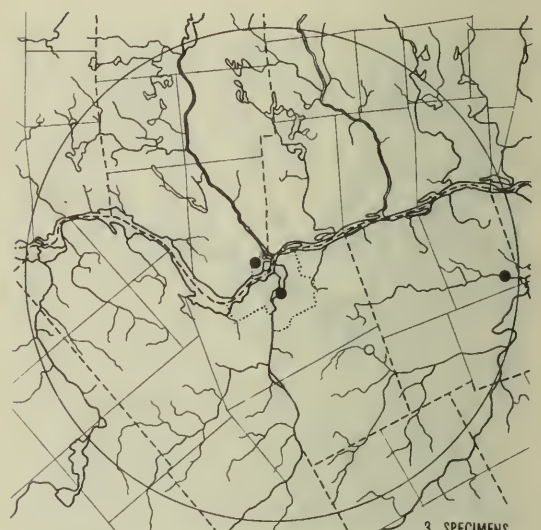
43. *Agropyron pectiniforme*



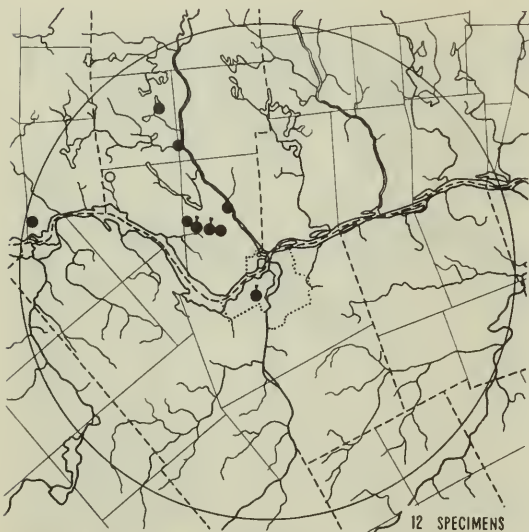
44. *Elymus virginicus*



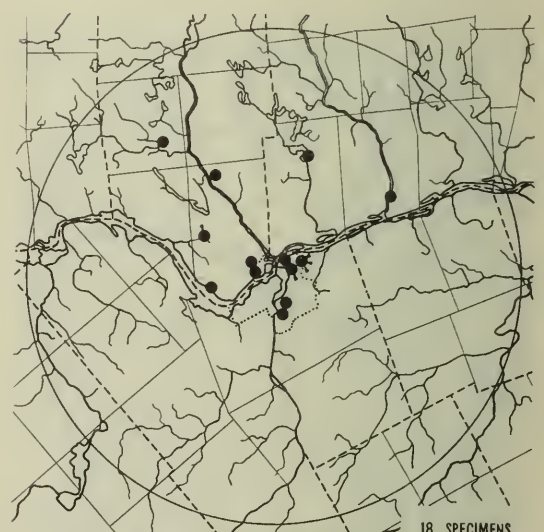
45. *Elymus canadensis*



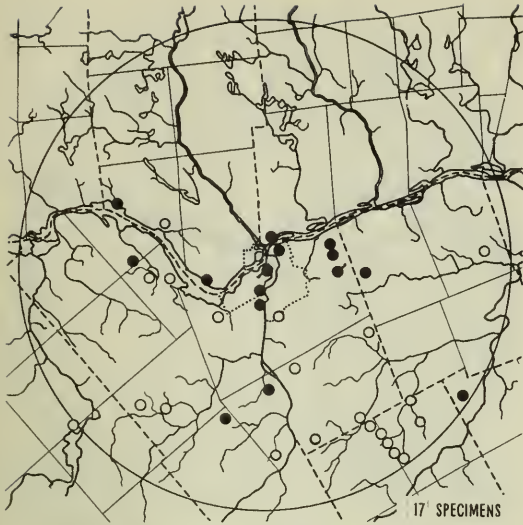
46. *Elymus wiegandii*



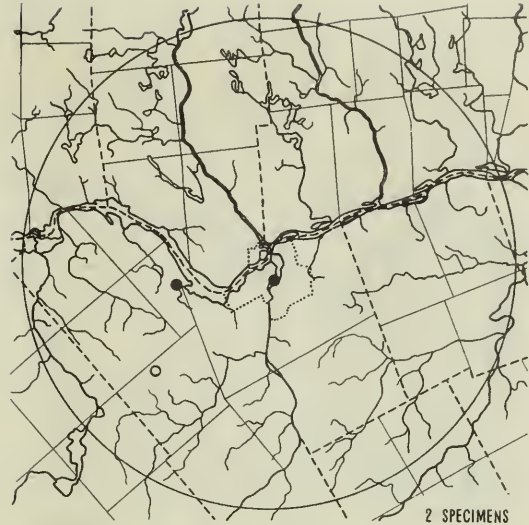
47. *Hystrix patula* f. *patula*



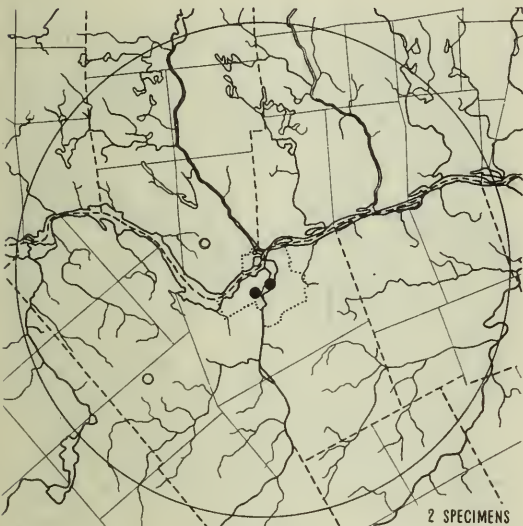
48. *Hystrix patula* f. *bigeloviana*



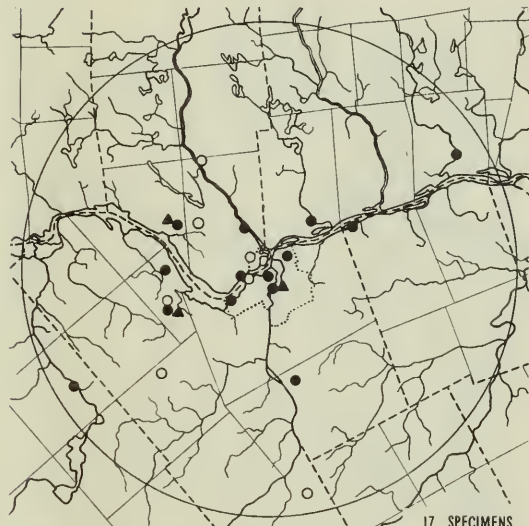
49. *Hordeum jubatum*



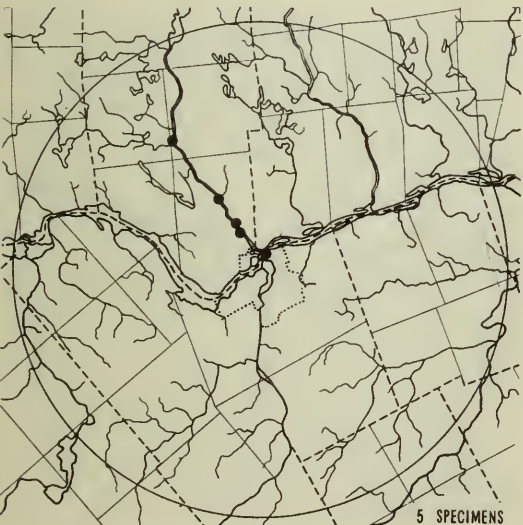
50. *Lolium perenne*



51. *Lolium multiflorum*



52. *Sphenopholis intermedia* • f. *intermedia*  
▲ pilose form



53. *Trisetum spicatum*

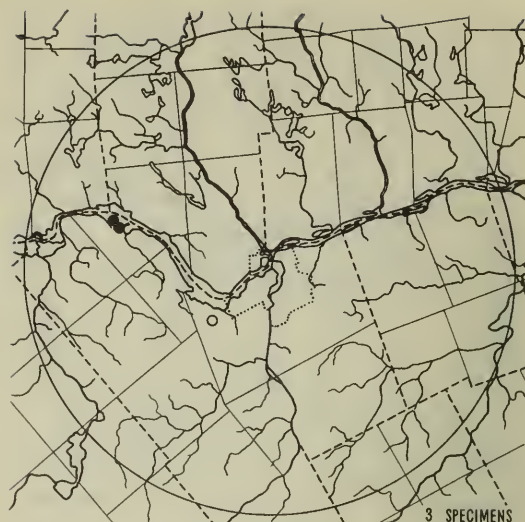


54. *Trisetum melicoides*

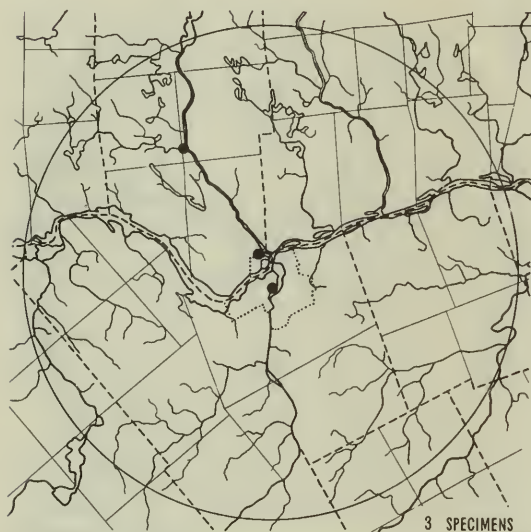




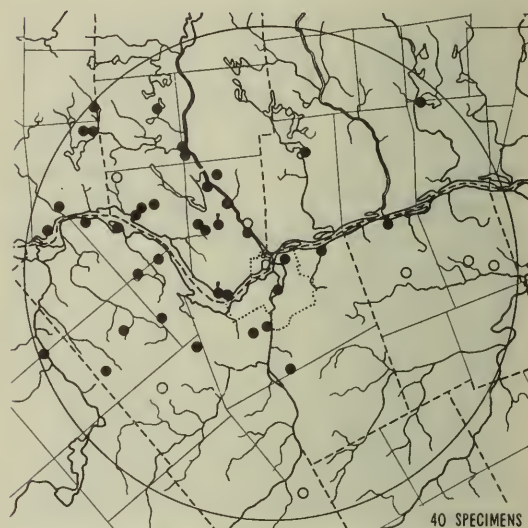
55. *Deschampsia caespitosa* • var. *glauca*  
▲ var. *parviflora*



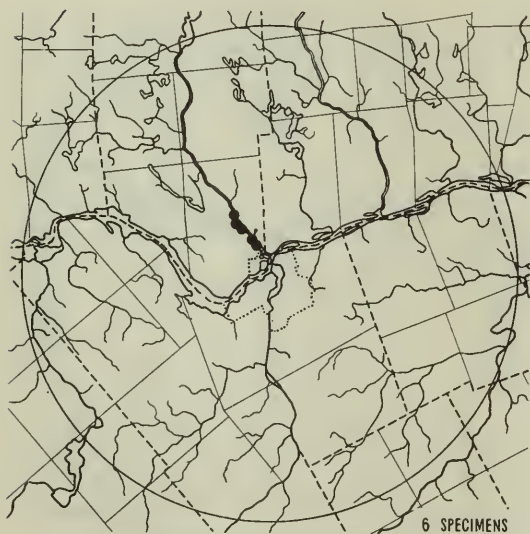
56. *Deschampsia flexuosa*



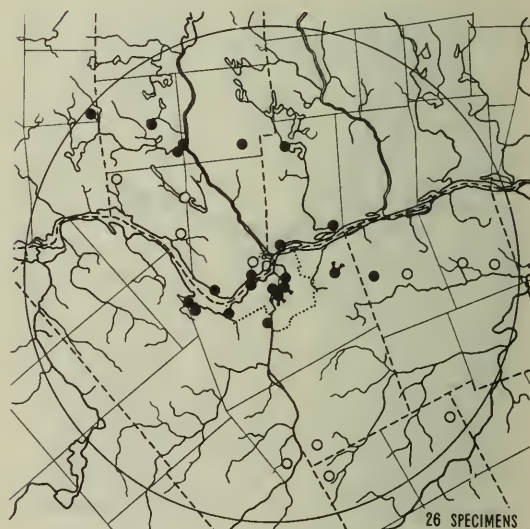
57. *Avena fatua*



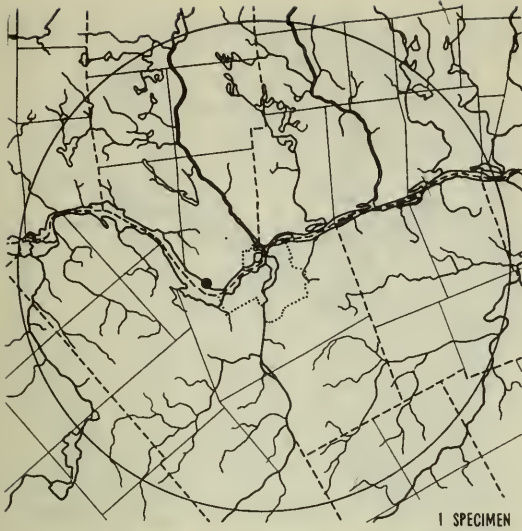
58. *Danthonia spicata*



59. *Danthonia compressa*

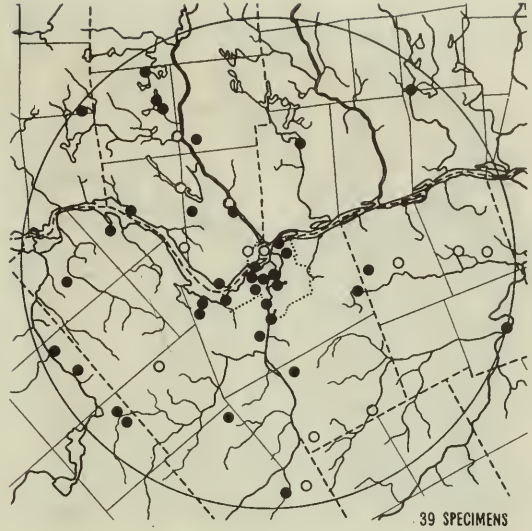


60. *Calamagrostis canadensis*



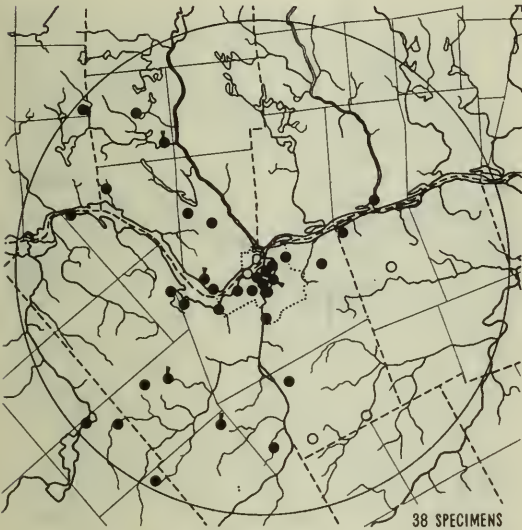
61. *Calamagrostis neglecta*

1 SPECIMEN



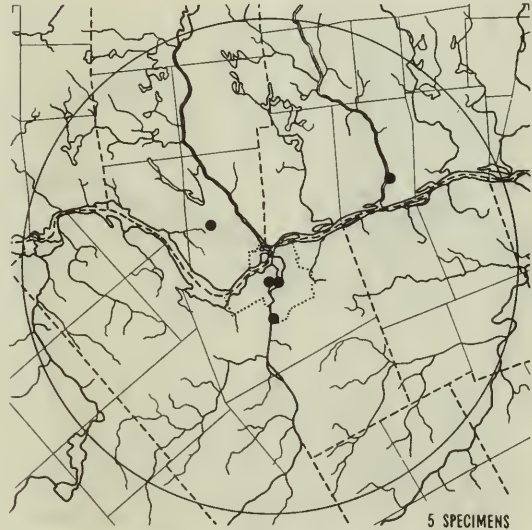
62. *Agrostis gigantea*

39 SPECIMENS



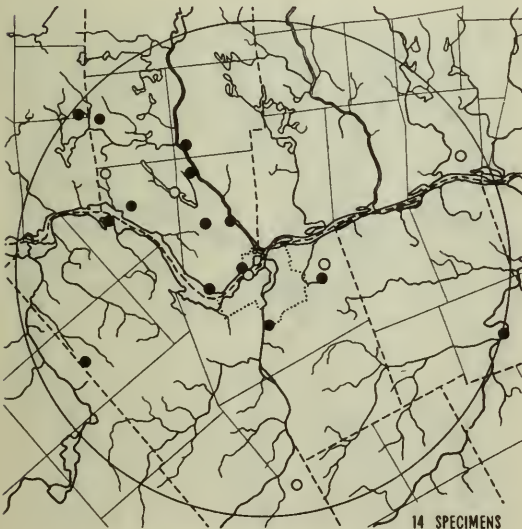
63. *Agrostis palustris*

38 SPECIMENS



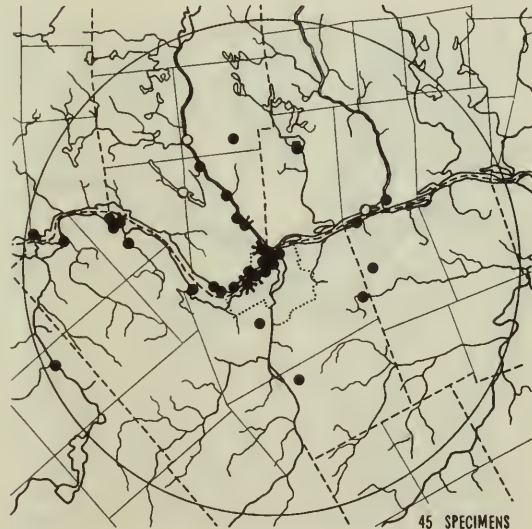
64. *Agrostis tenuis*

5 SPECIMENS



65. *Agrostis scabra*

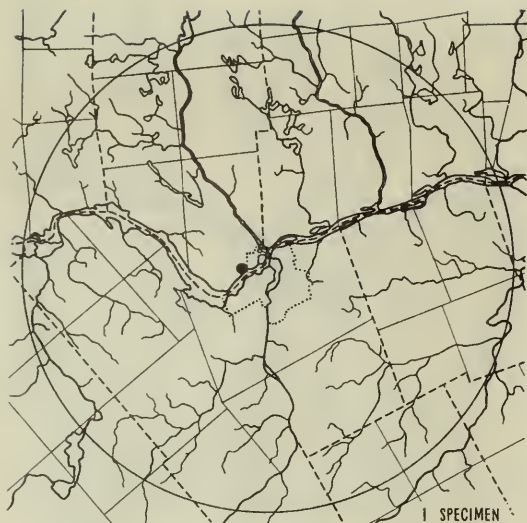
14 SPECIMENS



66. *Agrostis perennans*

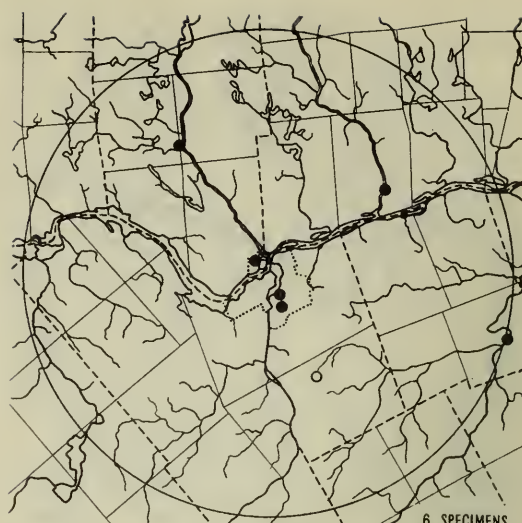
45 SPECIMENS





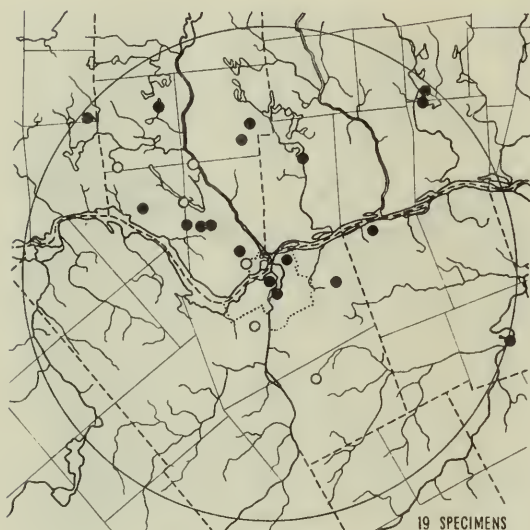
67. *Agrostis canina*

1 SPECIMEN



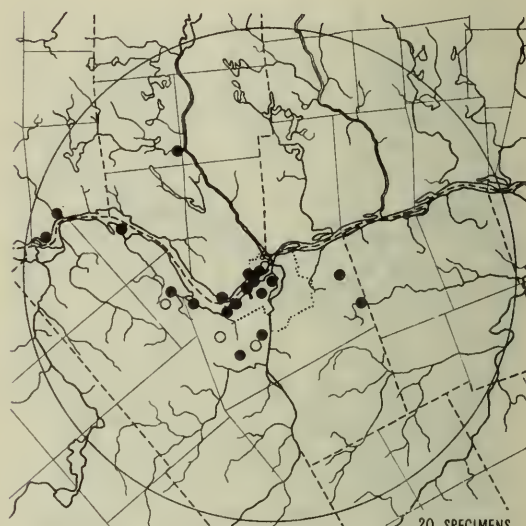
68. *Cinna arundinacea*

6 SPECIMENS



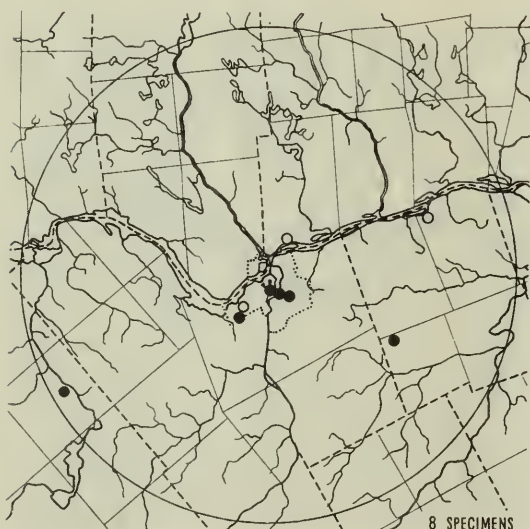
69. *Cinna latifolia*

19 SPECIMENS



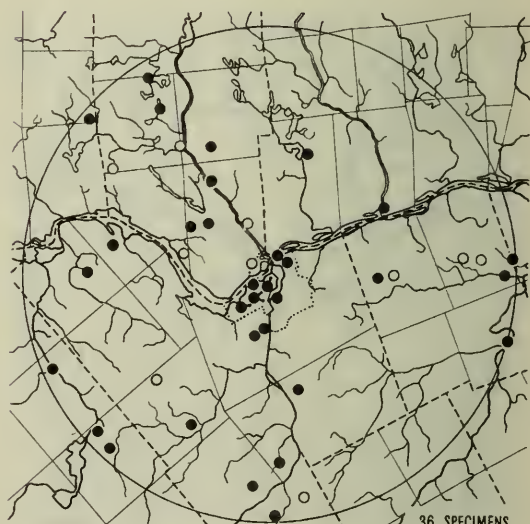
70. *Alopecurus aequalis*

20 SPECIMENS



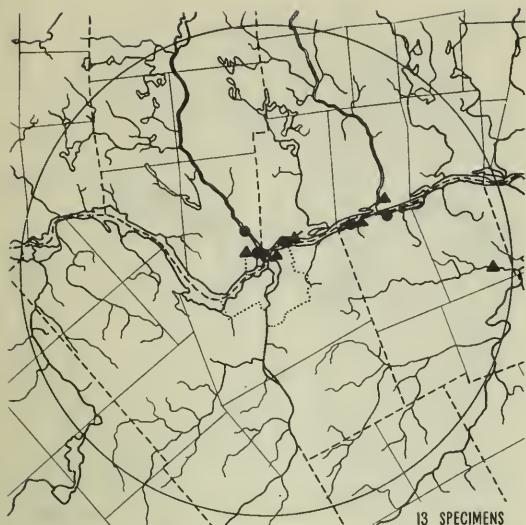
71. *Alopecurus pratensis*

8 SPECIMENS



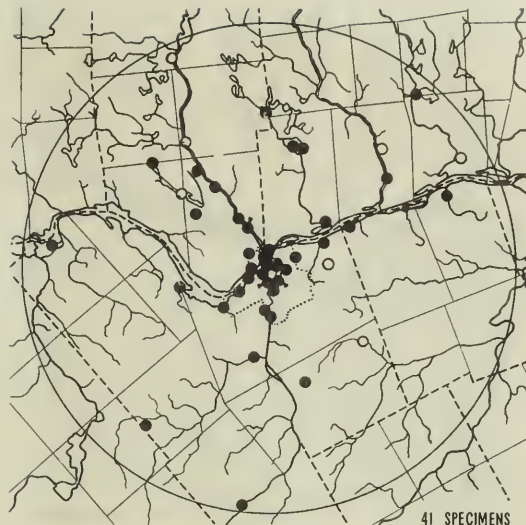
72. *Phleum pratense*

36 SPECIMENS



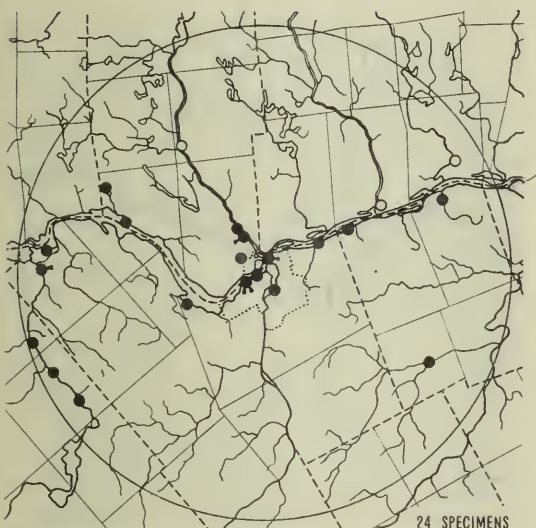
13 SPECIMENS

73. *Muhlenbergia frondosa* • *f. frondosa*  
▲ *f. commutata*



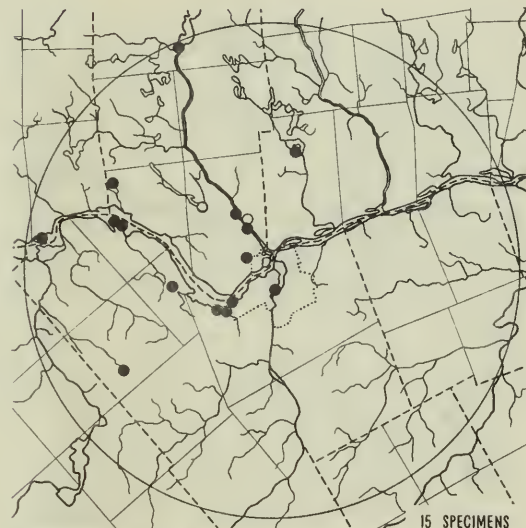
41 SPECIMENS

74. *Muhlenbergia mexicana* *f. mexicana*



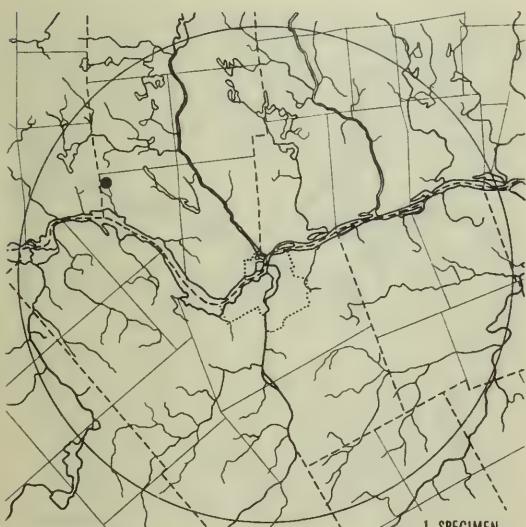
24 SPECIMENS

75. *Muhlenbergia mexicana* *f. setiglumis*



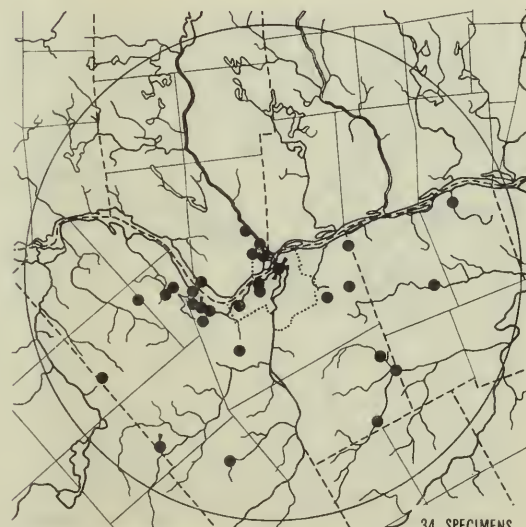
15 SPECIMENS

76. *Muhlenbergia glomerata*



1 SPECIMEN

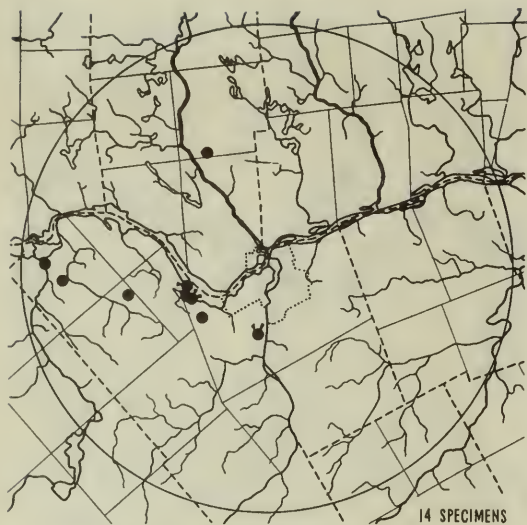
77. *Muhlenbergia uniflora*



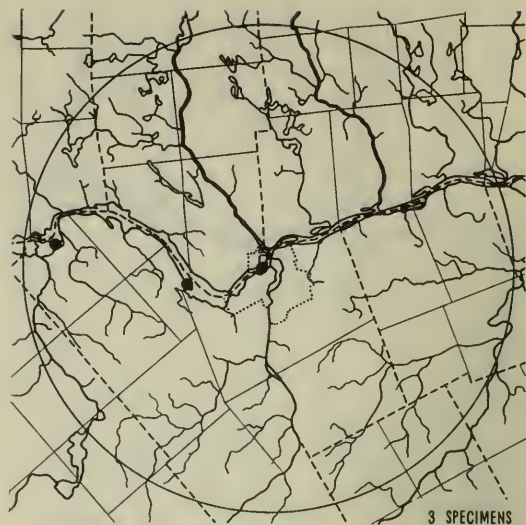
34 SPECIMENS

78. *Sporobolus neglectus*

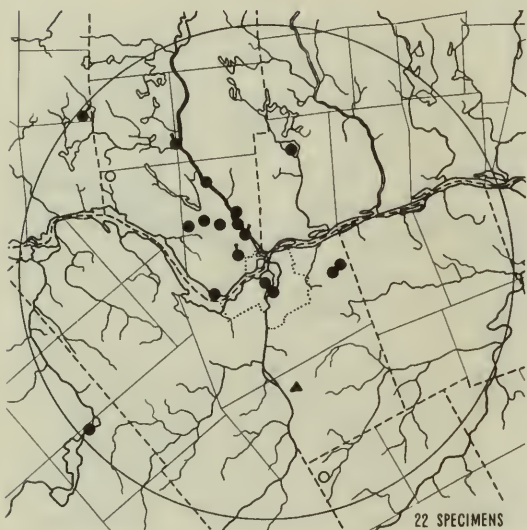




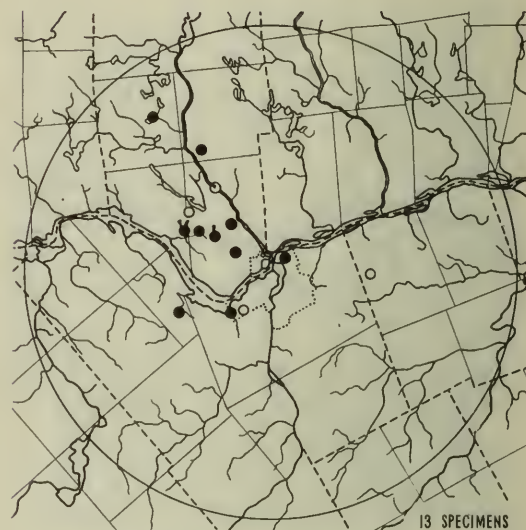
79. *Sporobolus vaginiflorus*



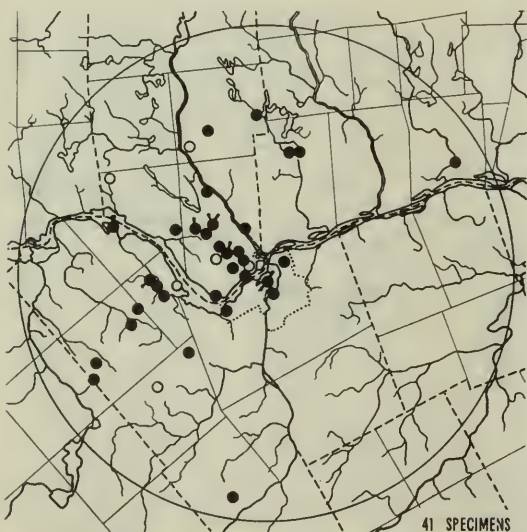
80. *Sporobolus heterolepis*



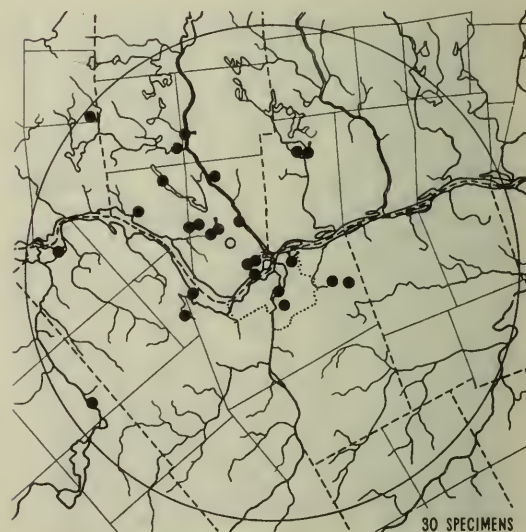
81. *Brachyelytrum erectum* • var. *erectum*  
▲ var. *septentrionale*



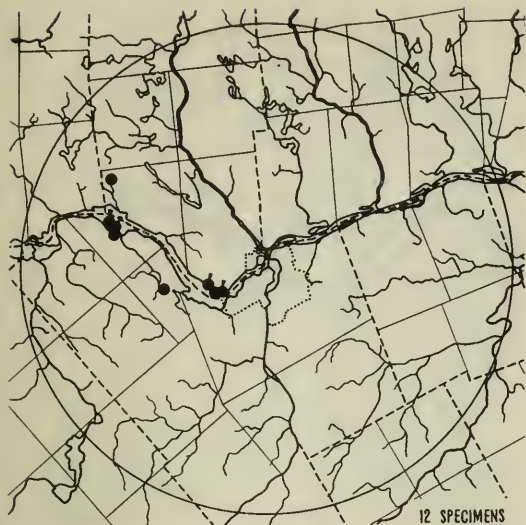
82. *Milium effusum*



83. *Oryzopsis asperifolia*

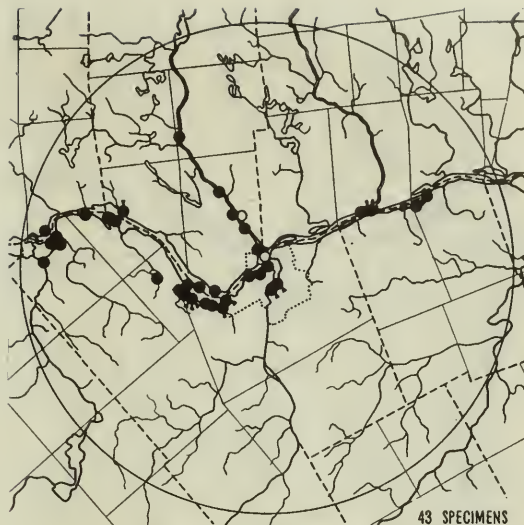


84. *Oryzopsis racemosa*



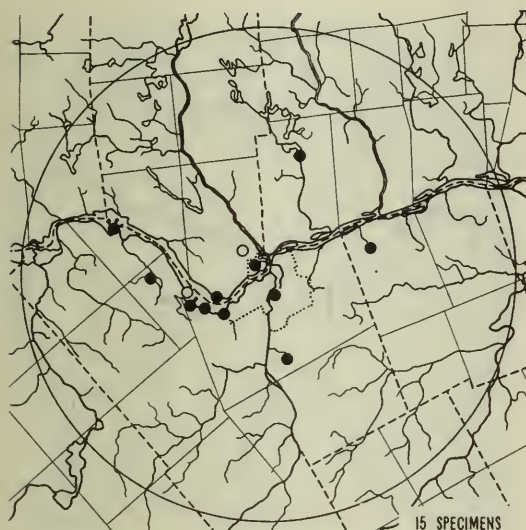
85. *Oryzopsis pungens*

12 SPECIMENS



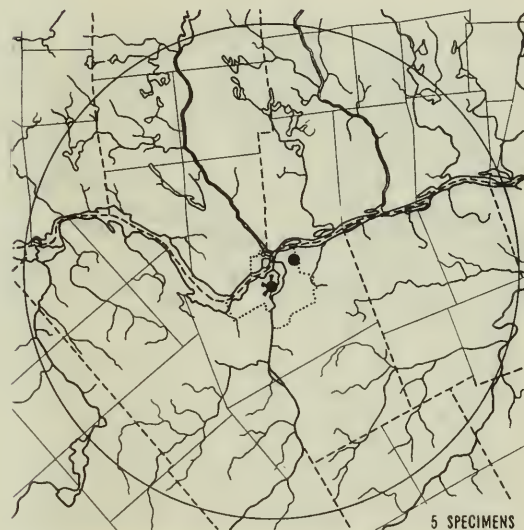
86. *Spartina pectinata*

43 SPECIMENS



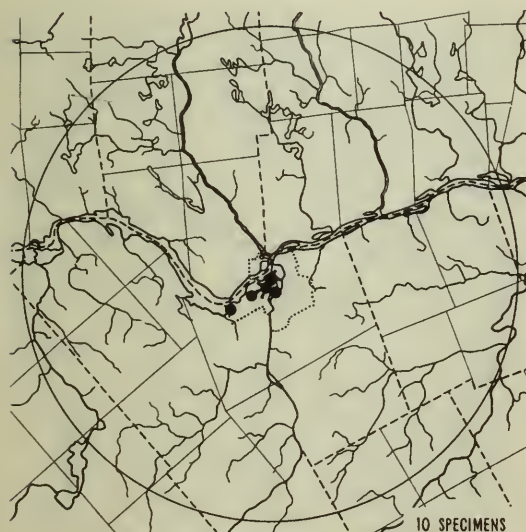
87. *Hierochloë odorata*

15 SPECIMENS



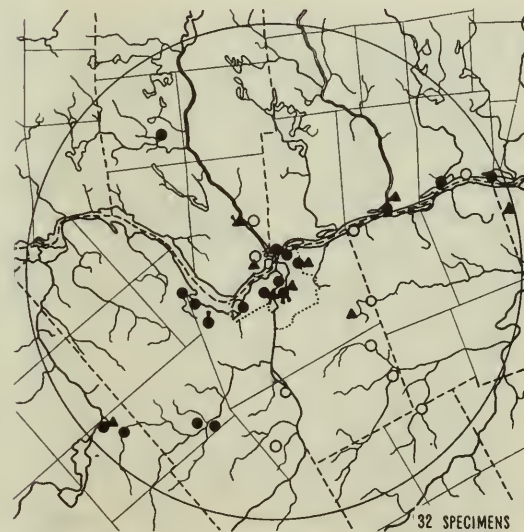
88. *Anthoxanthum odoratum*

5 SPECIMENS



89. *Phalaris canariensis*

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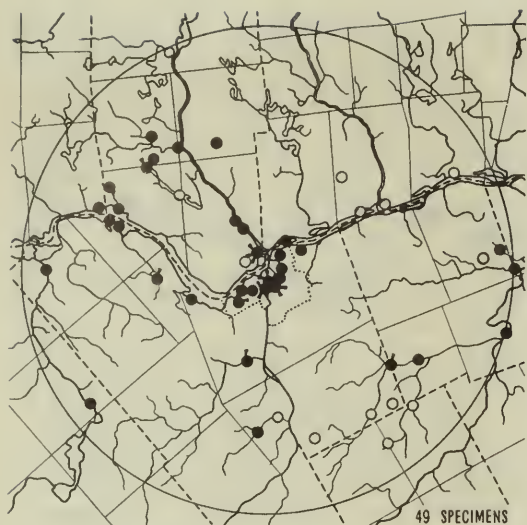


90. *Phalaris arundinacea* •

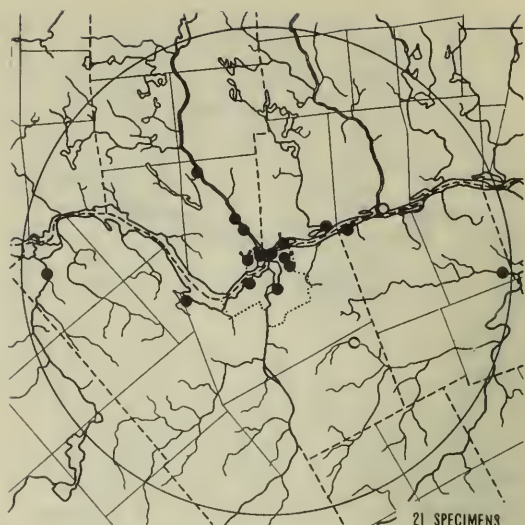
▲ f. *variegata*

32 SPECIMENS

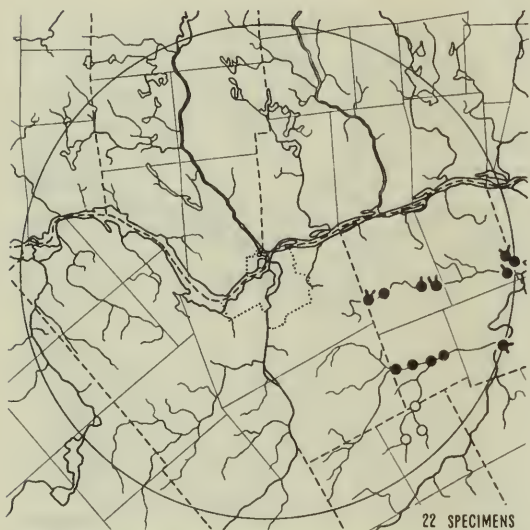




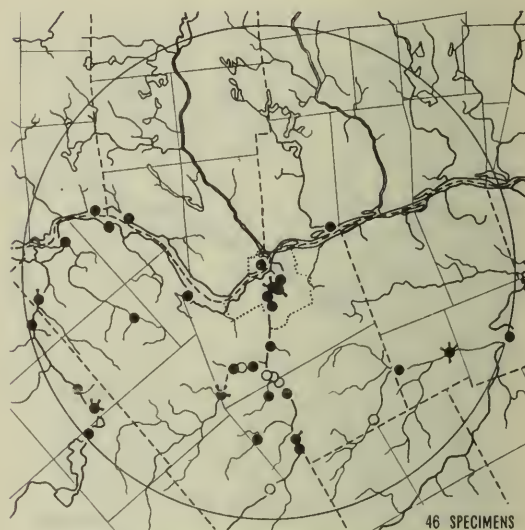
91. *Leersia oryzoides*



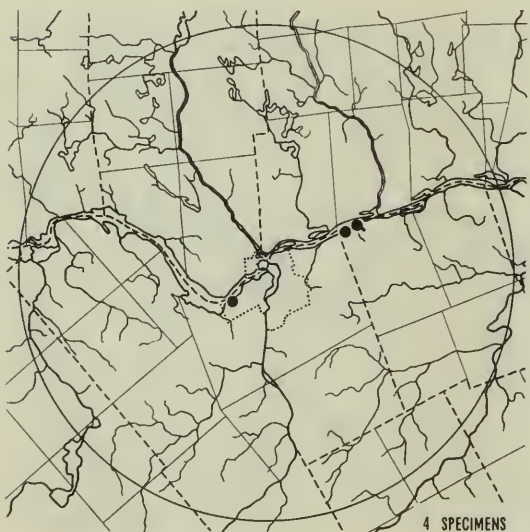
92. *Leersia virginica*



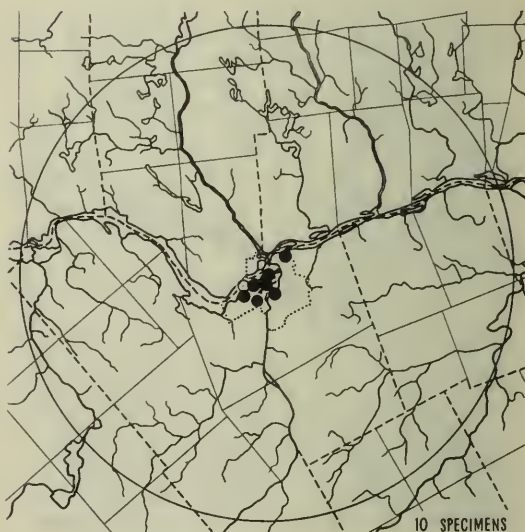
93. *Zizania aquatica* var. *aquatica*



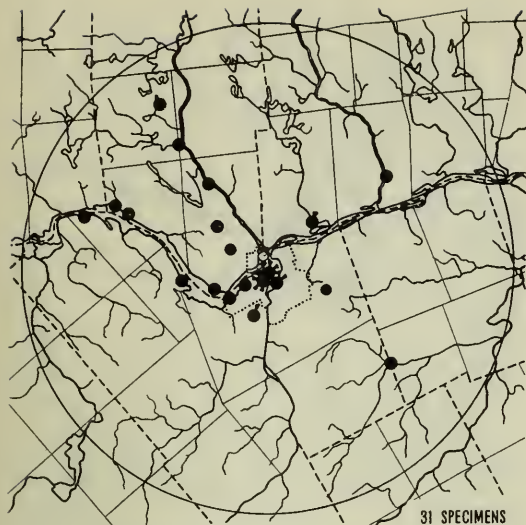
94. *Zizania aquatica* var. *angustifolia*



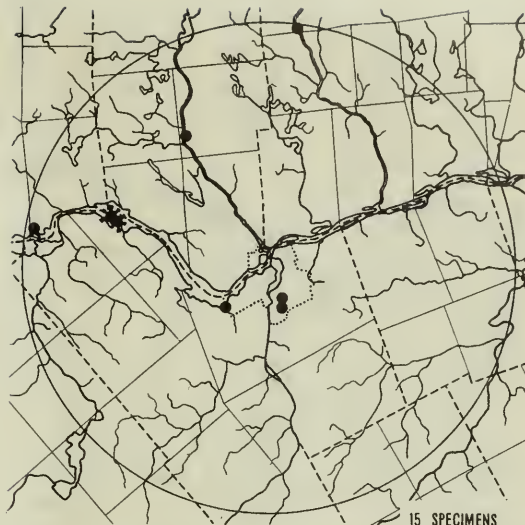
95. *Zizania aquatica* var. *interior*



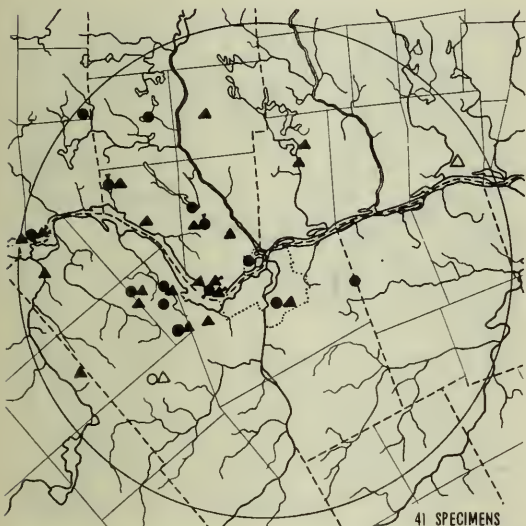
96. *Digitaria sanguinalis*



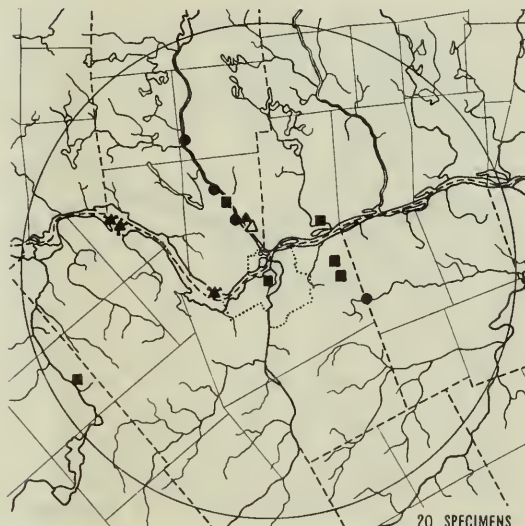
97. *Digitaria ischaemum*



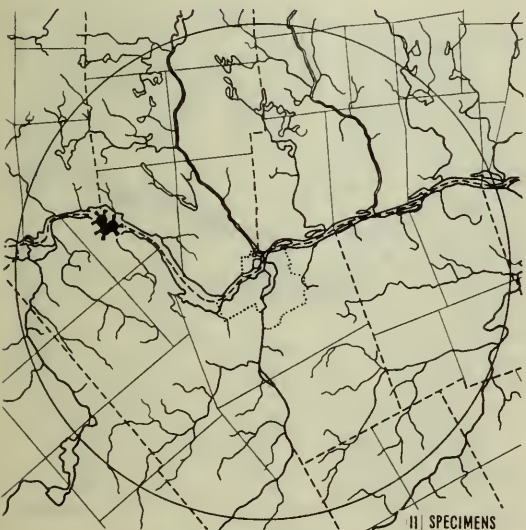
98. *Panicum depauperatum*



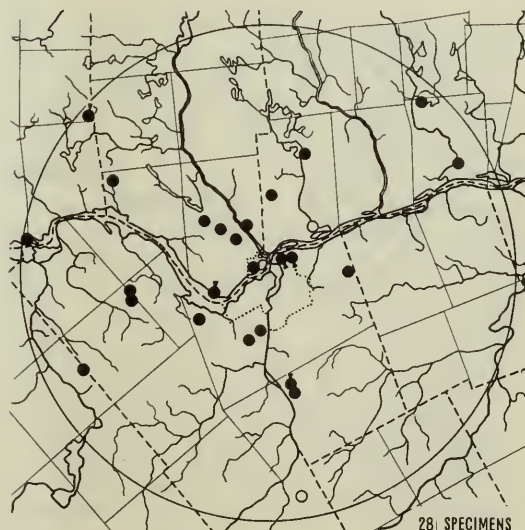
99. *Panicum linearifolium* • v. *linearifolium*  
▲ var. *wernerii*



100. *Panicum boreale* • var. *boreale*  
▲ var. *michiganense*

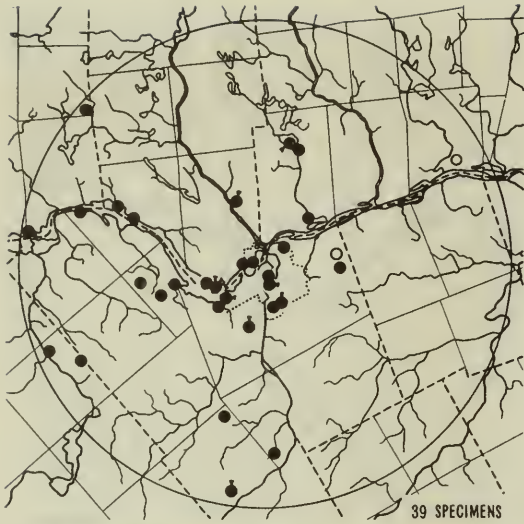


101. *Panicum tsugetorum*

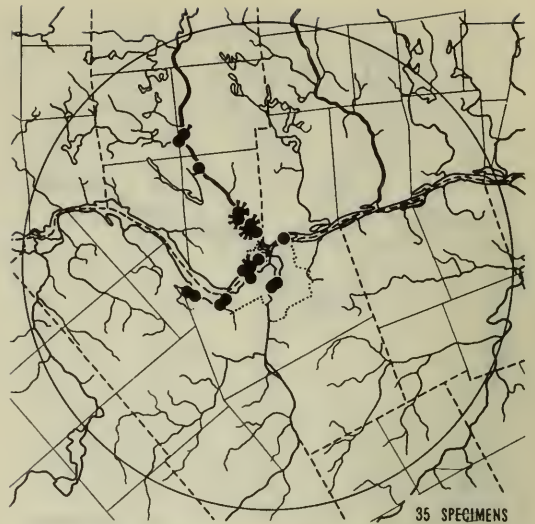


102. *Panicum lanuginosum* var. *implicatum*





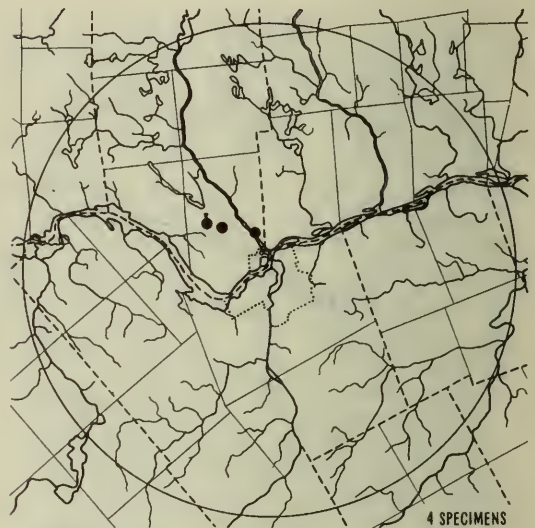
103. *Panicum lanuginosum* var. *fasciculatum*



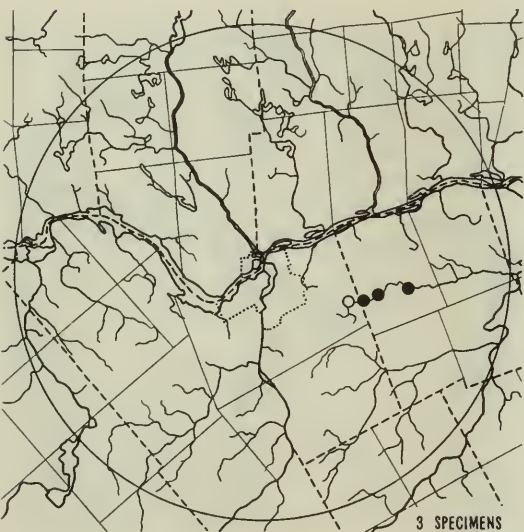
104. *Panicum lanuginosum*, *septentrionale*



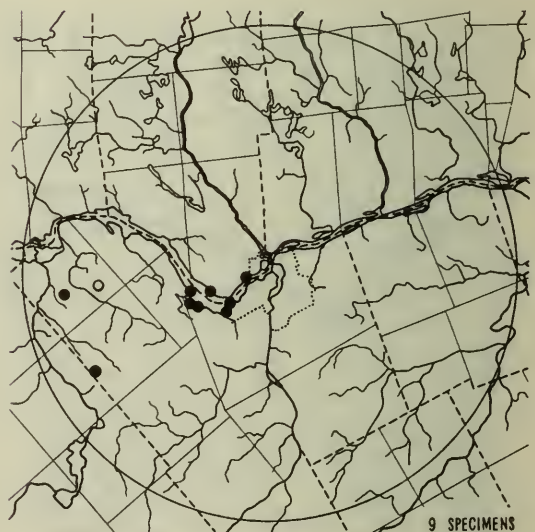
105. *Panicum xanthophysum*



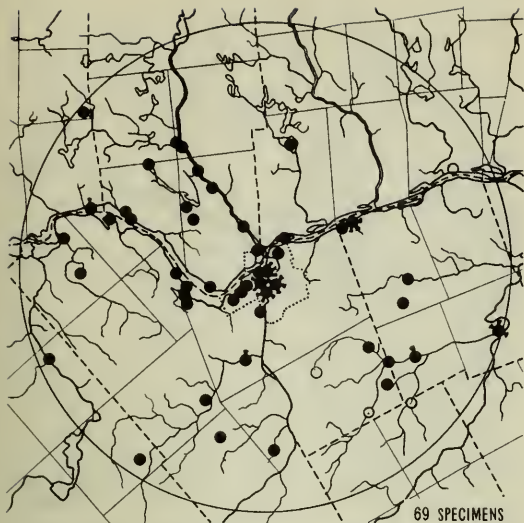
106. *Panicum latifolium*



107. *Panicum dichotomiflorum*



108. *Panicum flexile*



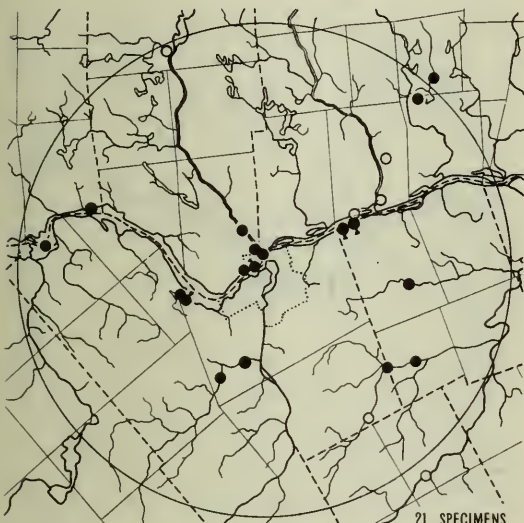
69 SPECIMENS

109. *Panicum capillare*



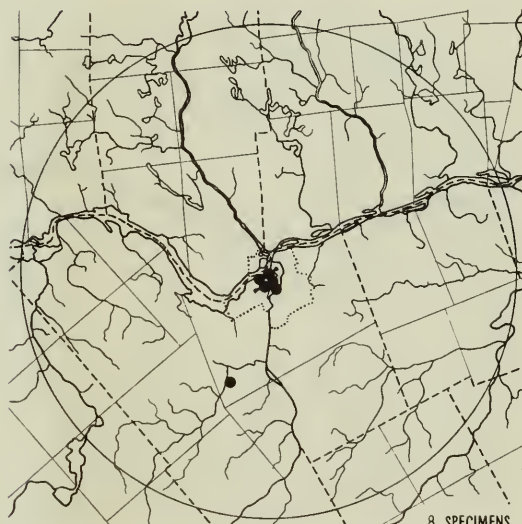
7 SPECIMENS

110. *Panicum philadelphicum*



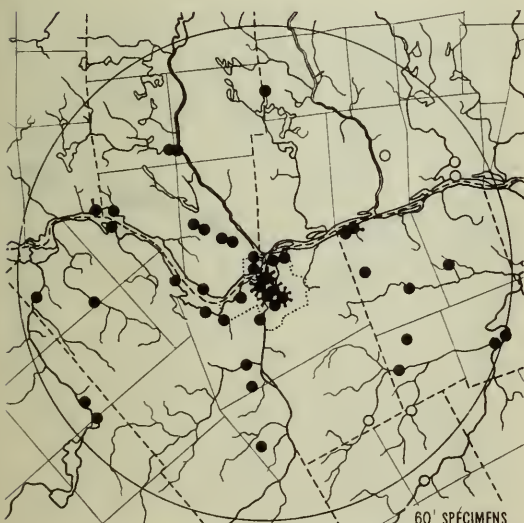
21 SPECIMENS

111. *Panicum tuckermanii*



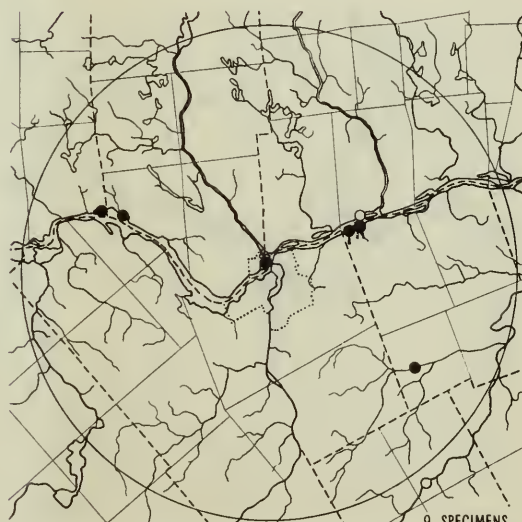
8 SPECIMENS

112. *Panicum miliaceum*



60 SPECIMENS

113. *Echinochloa crusgalli*



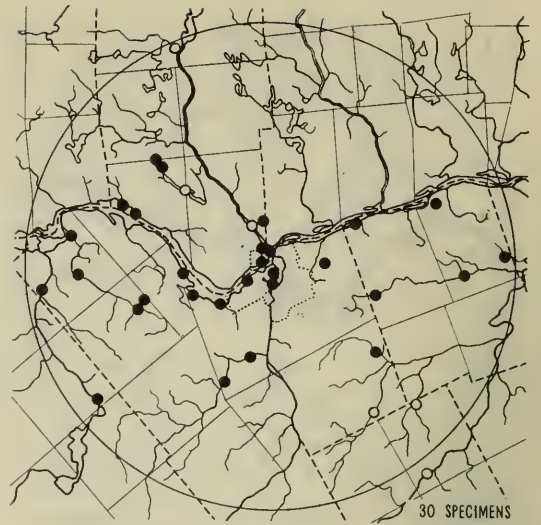
9 SPECIMENS

114. *Echinochloa pungens* var. *pungens*

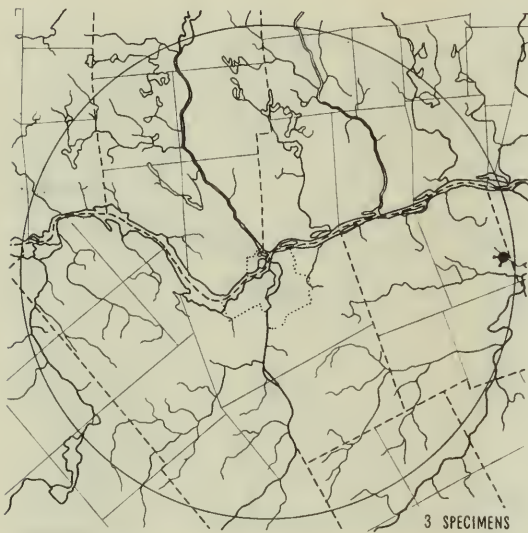




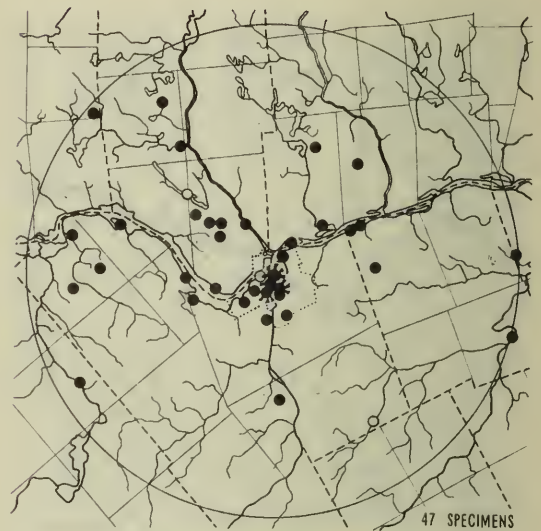
115. *Echinochloa pungens* var. *microstachya*



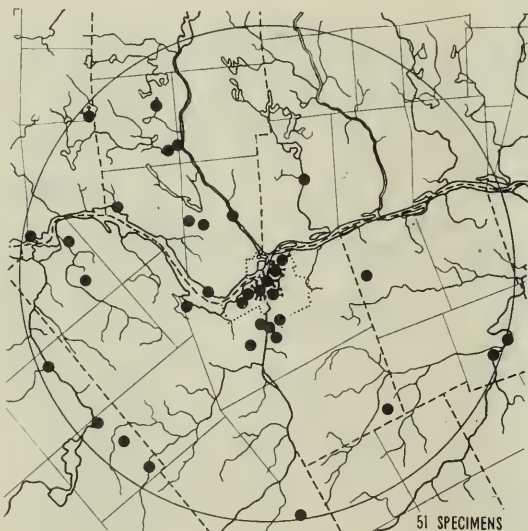
116. *Echinochloa pungens* var. *wiegandii*



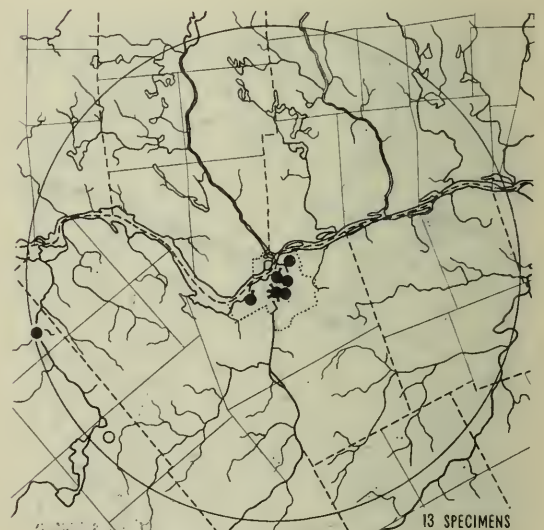
117. *Echinochloa walteri*



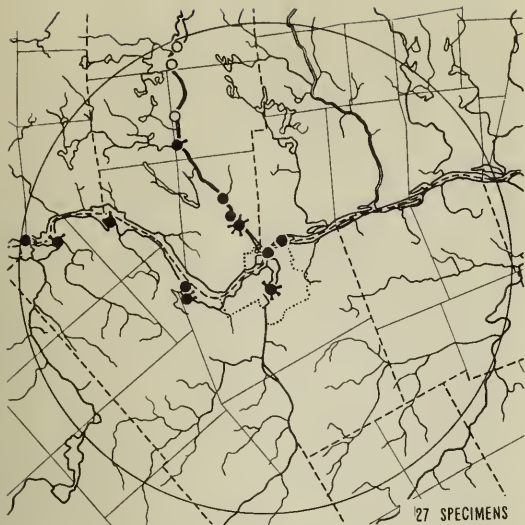
118. *Setaria glauca*



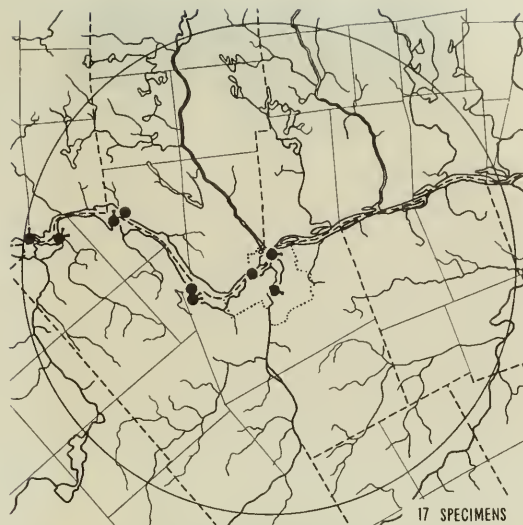
119. *Setaria viridis*



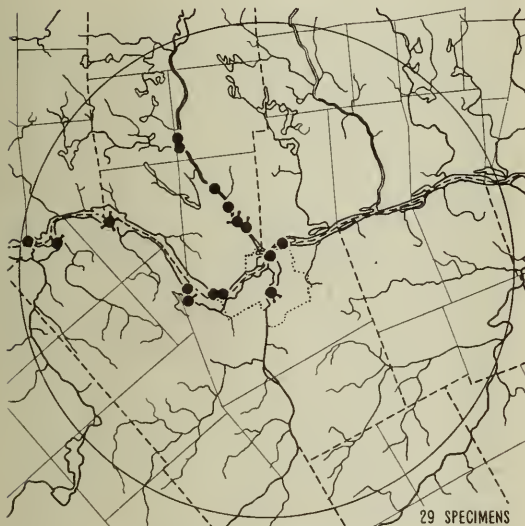
120. *Setaria verticillata*



121. *Andropogon scoparius*

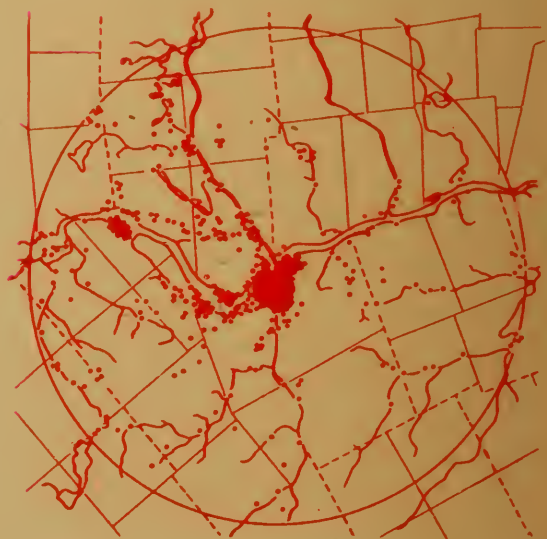
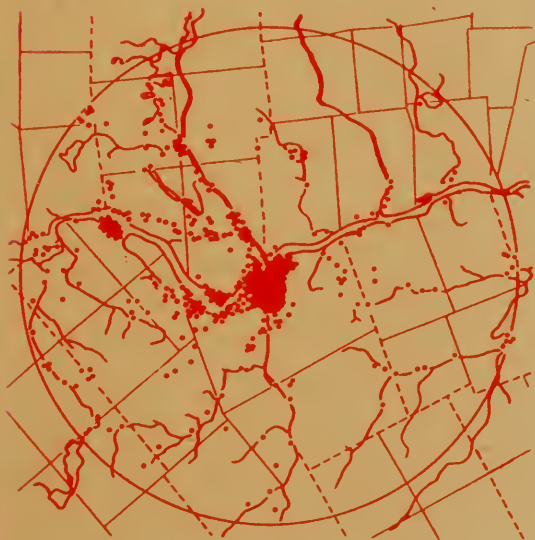
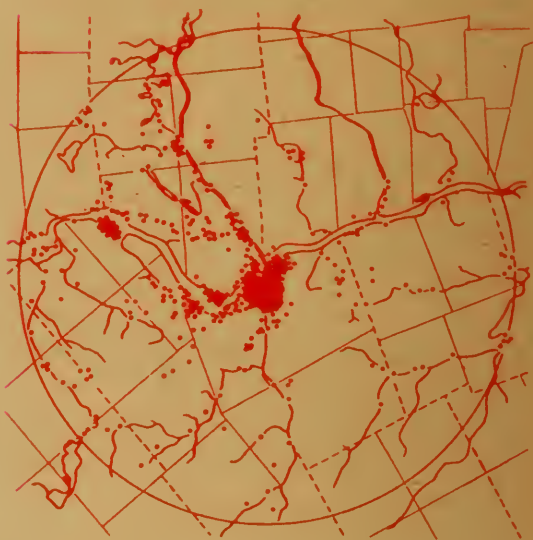
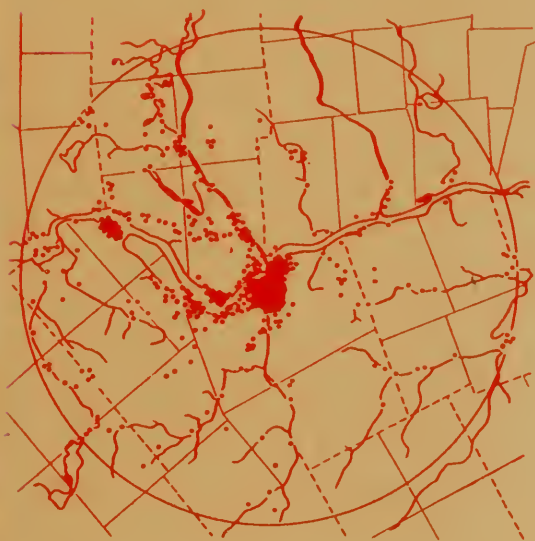
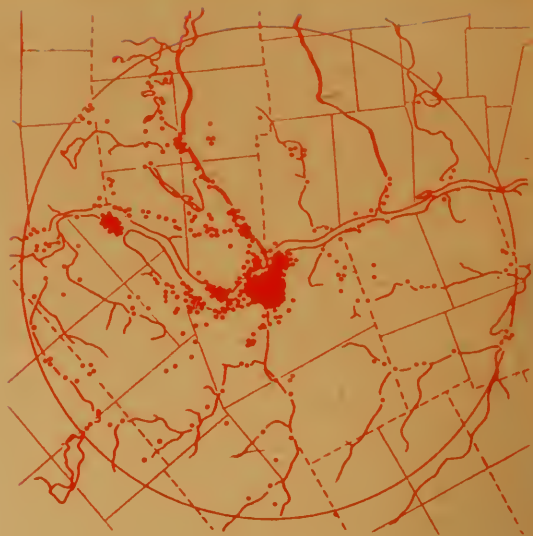
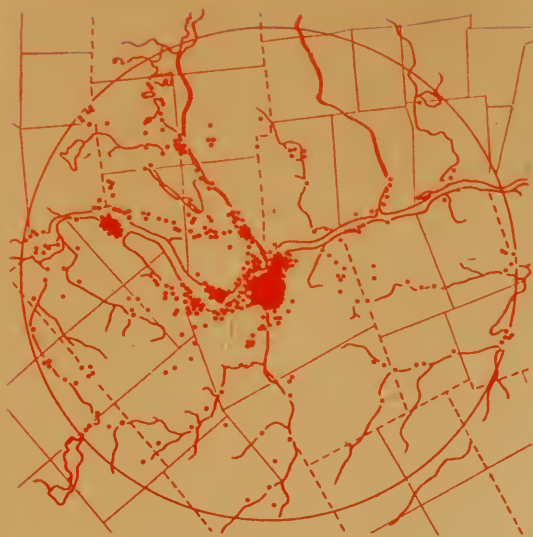


122. *Andropogon gerardii*



123. *Sorghastrum nutans*





Map representing the intensity of botanical collecting of grass specimens. Each dot represents 5 specimens of the total of 2,250 specimens collected up to 1953.

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